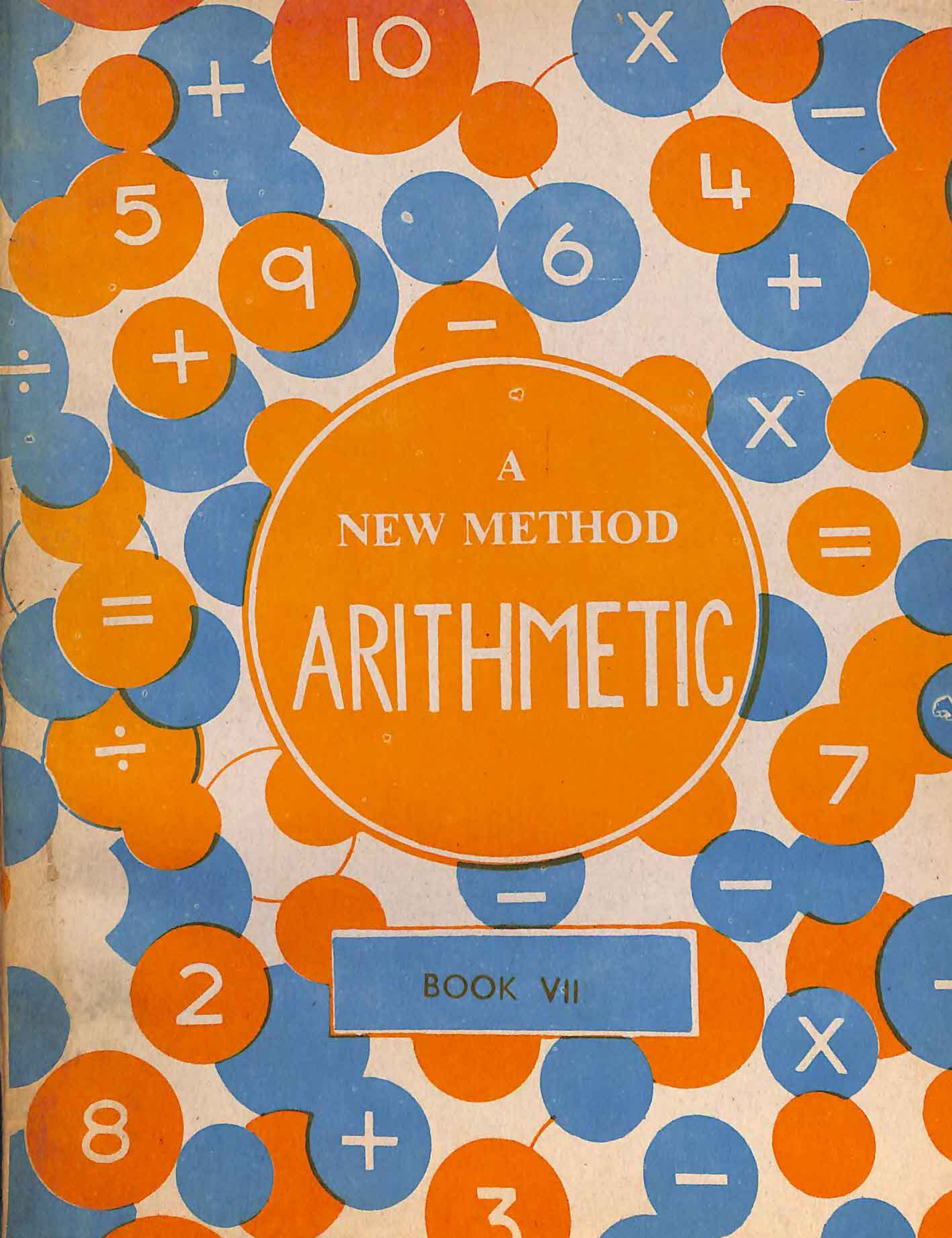

A
NEW METHOD
ARITHMETIC

BOOK VII

A NEW
METHOD ARITHMETIC

BOOK VII

By

TEJ RAM, *M.A.*

AND

PITAMBAR LAL, *M.A*

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PREFACE

We take great pleasure in presenting to the young students this series of books on Arithmetic. The dearth of suitable books in the market with Indian background encouraged us to write the present series. In preparing this series our chief aim has been to present the principles of the subject in most easy-to-understand and easy-to-work out manner. The subject matter has been presented in a very lucid manner and the language is easy.

Throughout the book the sound principle of taking difficulties one at a time has been strictly followed. Typical examples of almost every variety have been solved and in the ensueing exercises questions based on these examples have been set. Particular care has been taken in the classification and gradation of the subject matter. Clear diagrams have been supplied, wherever necessary, to make the reading interesting.

Mental Agility Tests and Revisional Exercises have been given at appropriate places. Objective Type Questions have also been given. These questions help in fixing the correct formulae and concepts in the minds of the students.

The answers to the numerical exercises given at the end of the book have been checked twice.

It is hoped that these books will meet the needs of the students for whom they are meant.

Corrections and suggestions for improvement will be thankfully received and acknowledged.

—*Authors*

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1

Numeration and Notation

1. Numeration (*Sankhya lekhan*) is the art of expressing in words a number given in figures.

2. Notation (*Sanketan*) is the art of expressing in figures a number given in words.

The student should now learn the following **Numeration Table.** It gives the names of places of figures representing a number.

Etc., Etc.
Trillions.

Hundreds of thousands of billions.
Tens of thousands of billions.
Thousands of billions.
Hundreds of billions.
Tens of billions.
Billions.

Hundreds of thousands of millions.
Tens of thousands of millions.
Thousands of millions.
Hundreds of millions.
Tens of millions.
Millions.

Hundreds of thousands.
Tens of thousands.
Thousands.

Hundreds.
Tens.
Units.

The figures 0, 1, 2, 3,................, 9 are called *international numerals* and the system of notation as the **English System of Notation.**

3. Every figure has two kinds of values : (*i*) **intrinsic value,** and (*ii*) **local value.** The absolute value of the figure is called its **intrinsic value** (*Nij maan*). The value of a figure which it has on account of its position in a line of figures is called its **local** or **place value** (*Sthanic maan*).

Thus in 432, the intrinsic value of 4 is 4 only, but its local value is 400.

Ex. 1. Express in figures : eighty-two billions, thirty-five millions, seventy-four thousands, six hundred and nine.

Sol. The number consists of 82 billions, no hundreds of thousands of millions, no tens of thousands of millions, no thousands of millions no hundreds of millions, 3 tens of millions, 5 millions, no hundreds of thousands, 7 tens of thousands, 4 thousands, 6 hundreds, no tens and 9 units. Hence the number is 82000035074609. *Ans.*

4. To express in words a number which is represented in figures.

Rule. Mark off the digits as far as millions in groups of three and the remaining figures in groups of six, then read the number from left to right, beginning with the highest order of units.

Thus, the number 56784,123456,789,543 means : fifty-six thousand seven hundred and eighty-four billions, one hundred and twenty-three thousands, four hundred and fifty-six millions, seven hundred and eighty-nine thousands, five hundred and forty-three.

Note. Beyond trillions we have—taking the figures in groups of six —*quadrillions, quintillions, sextillions, septillions, octillions, nonillions, etc.*

Ex. 2. Form the least number with the digits 2, 7, 9, 0, 5. What is the greatest number consisting of these digits ?

Sol. The least number will have the digits in ascending order from left to right, but zero cannot occupy the extreme left place. Hence the least number is 20579. *Ans.*

The **greatest** number will have the digits in descending order from left to right. Thus the greatest number is 97520. *Ans.*

Ex. 3. (*i*) What is the least number of five digits ?

(*ii*) What is the greatest number of five digits ?

Sol. (*i*) In forming the least number we should have the least digit at all the places. Zero is the least digit but it cannot occupy the extreme left place. Hence we will put next higher digit *i.e.*, 1 in the extreme left and the remaining four digits will be zeros. Hence the number will be 10000. *Ans.*

(*ii*) In forming the greatest number, we should have the greatest digit, *i.e.*, 9 in all the places. Thus the greatest number of five digits will consist of five nines and it will be 99999. *Ans.*

Exercise 1

Express the following number in words :

1. 4592. **2.** 77555. **3.** 123456. **4.** 8034509.

5. 8967056032. **6.** 56700043001.

Express in figures :

7. One hundred million, forty thousand, seven hundred eighty-nine.

8. One billion, five hundred sixty-seven thousand two hundred eighty-five million, two thousand and seventy-five.

9. Eight thousand and eighty million, eighty thousand and eight.

10. One hundred billion, one thousand million, one hundred thousand one hundred and one.

11. What is the local value of 5 in the following numbers :

(*i*) 657, (*ii*) 590870, (*iii*) 405060863 ?

12. What does each of the zeros in the following numbers indicate :
(*i*) 120, (*ii*) 405, (*iii*) 5023, (*iv*) 76008743 ?

13. Write down the greatest number of seven digits.

14. Write down the least number of seven digits.

15. What is the greatest number of six figures which begins with 7 and ends with 0 ?

16. What is the least number of four figures which begins with 9 ?

17. What is the greatest number which can be formed with the digits 4, 7, 0, 9 ? What is the least ?

18. What are the greatest and the least numbers which can be formed with the digits 7, 6, 7, 0, 1 ?

19. Find the difference between the greatest and least numbers formed with the digits, 5, 8, 4, 1, 2.

20. Find the difference between the greatest and the least numbers consisting of 6 digits.

INDIAN NUMERATION TABLE

5. We give below the Indian Numeration Table.

Tens of sankhs. Sankhs.	Tens of padams. Padams.	Tens of nils. Nils.	Tens of kharabs. Kharabs.	Tens of arabs. Arabs.	Tens of crores. Crores.	Tens of lacs. Lacs.	Tens of thousands. Thousands.	Hundreds. Tens. Units.

The number 7895432561 is read thus :

Seven arabs, eighty-nine crores, fifty-four lacs, thirty-two thousands, five hundreds and sixty-one.

Exercise 2

Write down in words the following numbers according to Indian numeration :

1. 1205. **2.** 900909. **3.** 9050403.

4. 990045061. **5.** 1220304064. **6.** 900008760012.

Express in figures :

7 Seventy lacs, thirteen thousand, five hundred and seventy-eight.

8 Twenty crores, seven lacs, eight thousand, three hundred and three.

9. One kharab, one arab, one crore, one lac, one thousand and one.

10. Five kharabs, fifty crores, fifty-one thousand and two.

THE ROMAN SYSTEM OF NOTATION

6. In this system the symbols I, V, X, L, C, D, M are used to denote respectively 1, 5, 10, 50, 100, 500 and 1000. A bar placed over a symbol multiplies its value by one thousand. Thus $\overline{\text{D}}$=500000.

The following rules should be noted :

(*i*) The symbols, I, X, C, M may be repeated twice or thrice.

Thus II=2, III=3, XX=20, XXX=30.

CC=200, CCC=300, MM=2000, MMM=3000.

(*ii*) When a smaller number is placed to the right of the greater number it is added to the greater.

Thus VI is 6, XV is 15, CX is 110.

(*iii*) When any one of the numbers, I, X, C is placed to the left of the greater number, it is subtracted from the greater.

Thus IV is 4, XL, is 40, XC is 90.

(*iv*) The symbol I can be placed before V or X once only, the symbol X can be placed before L or C once only ; and the symbol C can be placed before D or M once only.

Now all the numbers can be easily put down :

I	1	XV	15	CC	200
II	2	XVI	16	CCC	300
III	3	XVII	17	CD	400
IV	4	XVIII	18	D	500
V	5	XIX	19	DC	600
VI	6	XX	20	DCC	700
VII	7	XXX	30	DCCC	800
VIII	8	XL	40	CM	900
IX	9	L	50	M	1000
X	10	LX	60	MC	1100
XI	11	LXX	70	MCC	1200
XII	12	LXXX	80	MCM	1900
XIII	13	XC	90	MM	2000
XIV	14	C	100	MCMXXII	1922
				$\overline{\text{DCLX}}$CMXXXII	660932

Exercise 3

Express in English notation the numbers :

1. IX, XI, XXIV. 2. CCCXII, XCIX.
3. DC, CDVII, DCLXV. 4. CM, MCCV, MDCCVIII.
5. MCM, MCCXVI. 6. MDCCC, MDCCCLXXIX.

Express in Roman notation :

7. 89, 71, 301. 8. 251, 509, 999. 9. 5432, 2888. 10. 75869, 560502.

□

2

The Four Simple Rules

1. ADDITION

Exercise 4

Add together :

1. 4321
563
81806
60405
36096
4432

2. 98765432
5074321
50004
315
6170419
36667770

3. 100005
15
19081236
3600
29081256
309

Find the value of :

4. 9999+999+99+9.

Add together :

5. Fourteen million ; eight thousand and fifty ; one hundred three thousand and nine.

6. Two hundred seventy-six thousand and thirteen ; one hundred and fifty ; nine hundred and sixty-three thousand ; five million ; three hundred and seventy-three.

---

2. SUBTRACTION

Exercise 5

Perform the following subtractions :

1. 100000
77777

2. 909009
709087

3. 3288001
299881

Find the value of :

4. 204576−108064+39748+16709−9000+33008.

5. 150007+188006−57906−166189+14721.

---

3. MULTIPLICATION

To multiply in a given number of lines.

Sometimes a relation between the digits of a multiplier enables us much to shorten the work of multiplication.

Thus, to multiply by 637, we may multiply first by 7 and then multiply the result by 9, getting the product by 63 at once.

Similarly to multiply by 728504 we may first multiply by 8 and multiply the resulting product by 9 to get the product for 72, and this product for 72 is multiplied by 7 to get the product for 504.

Note. Care must be taken to arrange the lines correctly, by placing under the right-hand figure of every multiplier the right-hand figure of the corresponding product.

Ex. 1. Multiply 3412 by 15135 in two lines.

Sol. $135=15\times 9$

$$\begin{array}{rl}
3412 & \\
15135 & \\
\hline
51180{*}{*}{*} & \\
460620 & \\
\hline
51640620 & \textit{Ans.}
\end{array}$$

Ex. 2. Multiply 57632 by 728504 in three lines.

Sol.

$72=8\times 9$

$504=72\times 7$

$$\begin{array}{rl}
57632 & \\
728504 & \\
\hline
461056{*}{*}{*} & \\
4149504{*}{*}{*}{*} & \\
29046528 & \\
\hline
419851425 28 & \textit{Ans}
\end{array}$$

Ex. 3. Multiply 2552 by 891 in two lines.

Sol. $891=880+11$ and $880=80\times 11$.

$$\begin{array}{rll}
2552 & & \\
891 & & \\
\hline
28072 & \text{multiplying 2552 by 11} & \text{---}(i) \\
2245760 & \text{multiplying } (i) \text{ by 80} & \\
\hline
2273832 & \textit{Ans.} &
\end{array}$$

Exercise 6

Multiply :

1. 997 by 791.

2. 9086 by 5043.

Find the value of the following continued products :

3. $33\times 34\times 30$.

4. $16\times 41\times 625$.

Multiply in two lines :

5. 12349 by 273.

6. 4567 by 696.

7. 7756 by 11121.

8. 5625 by 14412.

Multiply in three lines :

9. 14985 by 96243. **10.** 58112 by 84735.

11. 75123 by 637378. **12.** 12341 by 624216.

13. Multiply 24553 by 13169, using only two partial products.

14. Multiply 24553 by 83218, using only three partial products.

15. Multiply 43605 by 1441 in two lines.

16. Multiply 2842 by 1332 in two lines.

---

4. DIVISION

Division by factors. Complete Remainder.

Ex. Divide 57613 by 210, using factors, and explain how you obtain the remainder.

Sol. $210=5\times6\times7$.

5 | 57613
6 | 11522 groups of 5, 3 units over.
7 | 1920 groups of 30, 2 groups of 5 over.
| 274 groups of 210, 2 groups of 30 over.

Remainder = 2 groups of 30 + 2 groups of 5 + 3 units

$=2\times30+2\times5+3$

$=73.$

The above work may be arranged thus :

5	57613		
6	11522	3,	3
7	1920	2,	10
	274	2,	60
			73 **Remainder**

∴ Quotient = 274 ; Remainder = 73. *Ans.*

From the above and similar examples we obtain the following rule for finding the complete remainder.

Complete Remainder

= 1st Remainder + 2nd Remainder × 1st Divisor

+ 3rd Remainder × 1st Divisor × 2nd Divisor + etc.

Exercise 7

Divide :

1. 393108 by 47. **2.** 178434 by 207. **3.** 749635 by 7361.

4. 1000001 by 77771.

Divide by factors and find the complete remainders :

5. 2792÷77. **6.** 41589÷108. **7.** 244067÷132.

8. 20064÷165. **9.** 566541÷192. **10.** 7954176÷168.

5. SIGNS AND BRACKETS

Ex. Simplify : 14−[21−{28−(14−3)}].

Sol. Here we shall first remove ( ), then { } and lastly [ ].

The expression = 14−[21−{28−(14−3)}] = 14−[21−{28−11}]
= 14−[21−17] = 14−4 = 10. *Ans.*

Exercise 8

Simplify :

1. 36÷4×8.
2. 75×25÷15.
3. 175−25×4
4. 666−66÷6.
5. 135×99−35×9−5×3.
6. 8485−5−200×2.
7. 777−(77−59).
8. 7089+(41+8)÷7.
9. 200−175−25+75.
10. 71−(18÷6×2).
11. 125−{75+(4×25−2×25)}.
12. 81−{52−6×(72−−12×6)}.
13. $74-[74-\{74-(74-\overline{74-37})\}]$.
14. $44-[33-\{44-(33-\overline{44-33})\}]$.
15. 841÷[172−{72+(72−44+43)}].

MISCELLANEOUS EXAMPLES

6. In a division sum we have four quantities :

Dividend, Divisor, Quotient and Remainder. These are connected by the relation :

Dividend = Divisor × Quotient + Remainder.

Ex. 1. The quotient arising from the division of a certain number by 309 is 79 and the remainder is 35. What is the number ?

Sol. Dividend = Divisor × Quotient + Remainder
= 309×79+35 = 24411+35 = 24446. *Ans.*

Ex. 2. When 792408 is divided by 149, the remainder is 26. Find the quotient.

Sol. Divisor × Quotient = Dividend − Remainder
∴ 149 × Quotient = 792408−26
or 149 × Quotient = 792382
∴ Quotient = 792382÷149 = 5318. *Ans.*

Exercise 9

1. In a division sum the quotient is 120, the divisor 456 and the remainder 333 ; find the dividend.

2. In a division sum the quotient is 105, the remainder is 95 and the divisor is equal to the sum of the quotient and the remainder ; find the dividend.

3. The quotient arising from the division of 56789 by a certain number is 461 and the remainder is 86 ; what is the divisor.

4. In a certain division sum, the dividend is 109876, the divisor is 3456 remainder being 2740 ; find the quotient.

Ex. What least number should be added to 2716321 to make it exactly divisible by 3456 ?

Sol. On dividing 2716321 by 3456, we get 3361 as remainder.

∴ The number to be added = 3456 − 3361
= 95. *Ans.*

```
3456)2716321(785
     24192
      29712
      27648
       20641
       17280
        3361
```

Ex 2. What least number should be subtracted from 2716321 to make it exactly divisible by 3456 ?

Sol. On dividing 2716321 by 3456, we get 3361 as remainder.

∴ The number to be subtracted = 3361. *Ans.*

```
3456)2716321(785
     24192
      29712
      27648
       20641
       17280
        3361
```

Ex. 3. What is the least number of five digits which is exactly divisible by 654 ?

Sol. The least number of five digits is 10000. On dividing 10000 by 654, we get 190 as remainder.

```
654)10000(15
    654
    3460
    3270
     190
```

∴ If we add (654 − 190), *i.e.* 464 to 10000, the sum will be divisible by 654.

∴ The required number = 10464. *Ans.*

Ex 4. Find the greatest number of five digits which is exactly divisible by 654.

Sol. The greatest number of five digits is 99999. On dividing 99999 by 654, we get 591 as remainder.

∴ The required number = 99999 − 591
= 99408.

```
654)99999(152
    654
    3459
    3270
     1899
     1308
      591
```

Ex. 5. A number being successively divided by 3, 5, 7 leaves 1, 3, 3, as remainders respectively. What are the remainders if the order of divisors be reversed ?

Sol. The complete remainder is clearly (1+3×3+3×5×3), *i.e.*, 55.

```
3 |
5 |      −1
7 |      −3
  |      −3
```

Suppose the final quotient is 1, then the dividend = 7×5×3+55 = 160.

Divide 160 by 7, 5, 3 we get the remainders as 6, 2, 1 respectively.

Ans.

```
7 | 160
5 | 22−6
3 |  4−2
  |  1−1
```

Exercise 10

1. What least number must be added to 777777 to make it exactly divisible by 5555 ?

2. What least number must be added to 5678914 to make it exactly divisible by 6666 ?

3. What least number must be subtracted from 456789 to make it exactly divisible by 654 ?

4. What least number must be subtracted from 9876543 to make it exactly divisible by 77792 ?

5. Find the least number of five digits which is exactly divisible by 468.

6. What is the least number of seven digits which is exactly divisible by 777 ?

7. Find the greatest number of four digits which is exactly divisible by 423.

8. Find the greatest number of six digits which is exactly divisible by 4238.

9. A number being successively divided by 4, 5 and 7 leaves 2, 3 and 4 as remainders respectively. What are the remainders if the order of divisors be reversed ?

10. A number being successively divided by 9, 11 and 13 leaves 8, 9 and 8 as remainders respectively. What are the remainders if the order of divisors be reversed ?

□

3

Highest Common Factor (H.C.F).

OR

Greatest Common Measure (G.C.M.)

1. Common Factor (*Sarva Bhajak or Samapvartak*) of two or more numbers is a number which divides each of them exactly. Thus 2 is a common factor of 18 and 24. A common factor is also called a **Common Measure.**

The Greatest Common Measure (*Mahattam Samapvartak*) of two or more numbers is the greatest number which divides each of them exactly. Thus 6 is the G.C.M. of 18 and 24.

Note. The terms **Highest Common Factor** (H.C.F.) and **Greatest Common Divisor (G.C.D.)** are often used in the place of Greatest Common Measure.

2. To find the G.C.M. of two or more numbers.

First Method. Method of Prime Factors.

Rule. Break the given numbers into prime factors, and then find the product of all the prime factors, *common to all the numbers.* This product will be the required G.C.M.

Ex. Find the H.C.F. of 1300, 1365, 1560.

Sol.

$$\begin{array}{r|r} 2 & 1300 \\ \hline 2 & 650 \\ \hline 5 & 325 \\ \hline 5 & 65 \\ \hline 13 & 13 \\ \hline & 1 \end{array} \qquad \begin{array}{r|r} 3 & 1365 \\ \hline 5 & 455 \\ \hline 7 & 91 \\ \hline 13 & 13 \\ \hline & 1 \end{array} \qquad \begin{array}{r|r} 2 & 1560 \\ \hline 2 & 780 \\ \hline 2 & 390 \\ \hline 3 & 195 \\ \hline 5 & 65 \\ \hline 13 & 13 \\ \hline & 1 \end{array}$$

$$\therefore \quad \begin{aligned} 1300 &= 2\times2\times5\times\mathbf{5}\times\mathbf{13} \\ 1365 &= 3\times\mathbf{5}\times7\times\mathbf{13}. \\ 1560 &= 2\times2\times2\times3\times\mathbf{5}\times\mathbf{13}. \end{aligned}$$

The factors common to the three given numbers are 5 and 13.

$\therefore$ the required H.C.F. $= 5\times13 = 65$. *Ans.*

Exercise 11

Find by the method of factors, the H.C.F. of :

1. 616, 1300.
2. 84, 120, 156.
3. 120, 210, 270.
4. 420, 735, 945.
5. 32, 64, 96, 160.
6. 126, 154, 182, 252.

3. Second Method. Method of Division

Rule. Divide the greater number by the smaller number, divide the divisor by the remainder, divide the remainder by the next remainder and so on, until no remainder is left. The last divisor is the required H.C.F.

The method depends upon an important fact that the common factor of **two numbers** divides exactly their *sum*, their *difference* and the *sum*, and *difference* of any multiple of the two numbers.

Ex. Find the H.C.F. of 13281 and 15844.

Sol.

```
13281)15844(1
      13281
       2563)13281(5
            12815
              466)2563(5     ∴ the required H.C.F.=233.  Ans.
                  2330
                   233)466(2
                       466
                        ×
```

4. To find the H.C.F. of more than two numbers.

Rule. Find the H.C.F. of any two of the numbers and then find the H.C.F. of this H.C.F. and the third number and so on. The last H.C.F. will be the required H.C.F.

Ex. Find the H.C.F. of 1659, 3423 and 917.

Sol. Let us first find the H.C.F. of 1659 and 3423.

```
1659)3423(2
     3318
      105)1659(15
          105
           609
           525
            84)105(1
               84
               21)84(4
                  84
                   ×
```

∴ the H.C.F. of 1659 and 3423 is 21.

Now we shall find the H.C.F. of 21 and 917.

```
21)917(43
   84
    77
    63
    14)21(1
       14
        7)14(2
          14
           ×
```

∴ the required H.C.F.=7. *Ans.*

Exercise 12

Find the H.C.F. of :

1. 1265, 1300.
2. 6419, 10087.
3. 10857, 15087.
4. 3781, 9154.
5. 11121, 12803.
6. 21034, 26697.
7. 10524, 12752, 3720.
8. 4536, 3972, 5684.
9. 3128, 1794, 2806.
10. 1751, 1957, 2369, 2987.

---

5. Problems on H.C.F.

Ex. 1. Find the greatest weight when can be contained exactly in 6 *kg* 7 *hg* 4 *dag* 3 *g* and 9 *kg* 9 *dag* 7 *g*.

Sol.
6 *kg* 7 *hg* 4 *dag* 3 *g*=6743 *g*,
and 9 *kg* 9 *dag* 7 *g*=9097 *g*.

∴ the greatest weight required is the H.C.F. of 6743 *g* and 9097 g.

The H.C.F. of 6743 *g* and 9097 *g* is 11 *g*.

∴ the required weight =11 *g*. *Ans.*

```
6743)9097(1
     6743
     2354)6743(2
          4708
          2035)2354(1
               2035
                319)2035(6
                    1914
                     121)319(2
                         242
                          77)121(1
                              77
                              44)77(1
                                 44
                                 33)44(1
                                    33
                                    11)33(3
                                       33
                                        ×
```

Note. To find the H.C.F. of two or more *concrete quantities* reduce them to the same unit.

Ex. 2. What is the greatest number that will divide 2930 and 3250 and will leave as remainders 7 and 11 respectively ?

Sol. Since on dividing 2930 by the number, remainder 7 is left, the number must divide 2930−7 or 2923 exactly.

Similarly it must divide 3250−11 or 3239 exactly.

Hence the greatest number required is the G.C.M. of 2923 and 3239.

```
2923)3239(1
     2923
      316)2923(9
          2844
            79)316(4
               316
                ×
```

∴ the required number=79. *Ans.*

Ex. 3. Find the largest size of a square tile that can be used for paving the rectangular space 54 *m* by 21 *m*. Find how many such tiles will be needed.

Sol. Since the tiles are to be fitted an exact number of times along the length and breadth of the space hence, the length of the side of the square tile must be a common measure of 54 *m* and 21 *m*. But we are to find the greatest size of the square tile, therefore, we should find the G.C.M. of 54 *m*. and 21 *m*.

$$\begin{array}{l} 21)\overline{54}(2 \\ \quad 42 \\ \hline \quad 12)21(1 \\ \qquad 12 \\ \hline \qquad 9)12(1 \\ \qquad\quad 9 \\ \hline \qquad\quad 3)9(3 \\ \qquad\qquad 9 \\ \qquad\qquad \times \end{array}$$

G.C.M. of 54 *m* and 21 *m*=3 *m*.

∴ the greatest side of the square tile=3 *m* *Ans*.

Tiles needed to fit along the length$=\dfrac{54\ m}{3\ m}=18$.

Tiles needed to fit along the breadth$=\dfrac{21\ m}{3\ m}=7$.

∴ total number of tiles needed $=18\times7=126$. *Ans*.

Exercise 13

1. The principal of a school wishes to distribute 84 balls and 108 bats equally among a number of boys. Find the greatest number receiving the gift in this way.

2. Find the greatest weight which can be contained exactly in 3 *kg* 7 *hg* 8 *dag* 1 *g* and 9 *kg* 1 *hg* 5 *dag* 4 *g*.

3. Find the greatest length which can be contained exactly in 10 *m* 5 *dm* 2 *cm* 4 *mm* and 12 *m* 7 *dm* 5 *cm* 2 *mm*.

4. Find the greatest length of a rod which can measure exactly 42 *m*, 49 *m* and 84 *m*. Find also the number of times the rod is contained in each length.

5. Find the greatest number which divides 16997 and 64892 leaving 2 as remainder in each case.

6 Find the greatest number such that if 13693 and 17191 be divided by it, the remainder in each case is 19.

7. Find the greatest number which divides 1750 and 2000 leaving 48 and 2 as remainders respectively.

8. Find the greatest number which divides 10698, 6443 and 14995 leaving 18, 35 and 43 as remainders respectively.

9. A shopkeeper bought a certain number of books for *Rs* 118 44 and some more for *Rs* 85·68 at the same rate. Find the least possible number of books bought.

10. A book-seller bought certain number of books for *Rs* 337 50 and

sold some of them at the cost price for *Rs* 213·75. Find the least number of books left with him.

11. Find the largest size of a square tile that can be used for paving a rectangular plot 84 *m* by 162 *m*. Find also the number of tiles that will be needed.

12. Find the least number of square tiles that will be needed to pave a plot 225 *m* by 30 *m*.

□

4

Least Common Multiple (L.C.M.)

1. The Least Common Multiple (*Laghutam Samapvartya*) of two or more given numbers is the *least* number which is exactly divisible by each of them.

Thus 12, 24, 48 are common multiples of 2, 3, 4.

But 12 is the least common multiple of 2, 3, 4.

Note. *The Least Common Multiple* is sometimes called the *Lowest Common Multiple.*

2. To find the L.C.M. of two or more given numbers.

First Method. The method of prime factors.

Rule. Resolve the given numbers into their prime factors and then find the product of the *highest power* of all the factors that occur in the given numbers. This product will be the required L.C.M.

Ex. 1. Find the L.C.M. of 6, 9, 15, 24.

Sol. $6=2\times3$ $\quad 9=3\times3=3^2$

$15=3\times5$ $\quad 24=2\times2\times2\times3=2^3\times3.$

The prime factors that occur in the given numbers are 2, 3 and 5. The highest powers are respectively 2^3, 3^2 and 5.

∴ the required L.C.M. $=2^3\times3^2\times5=360.$ *Ans.*

Note. The L.C.M. of numbers which are prime to each other is their product.

Thus the L.C.M. of 3, 8, 11 is $3\times8\times11=264.$

Second Method. The Method of Division.

The L.C.M. of several small numbers can be easily found by the following

Rule. Write the given numbers in a line, separating them by commas. Divide by any one of the prime numbers, 2, 3, 5, etc., which will exactly divide at least two of the given numbers. Set down the quotients and the undivided numbers in a line below the first. Repeat the process until you get a line of numbers which are prime to each other. The product of all the divisors and the numbers in the last line will be the required L.C.M.

Ex. 2. Find the L.C.M. of 4, 6, 8, 10, 12.

Sol.

$$\begin{array}{r|l} 2 & 4,\ 6,\ 8,\ 10,\ 12 \\ \hline 2 & 2,\ 3,\ 4,\ 5,\ 6 \\ \hline 3 & 1,\ 3,\ 2,\ 5,\ 3 \\ \hline & 1,\ 1,\ 2,\ 5,\ 1 \end{array}$$

$\therefore$ L.C.M.$=2\times2\times3\times2\times5=120$. *Ans.*

Exercise 14

Find the L.C.M. by the method of factors of :

1. 12, 18, 24.
2. 24, 63, 70.
3. 42, 63, 162.
4. 10, 44, 55.
5. 91, 65, 75, 39.
6. 42, 78, 104, 112.

Find the L.C.M. by the method of division of :

7. 9, 15, 16, 35, 36.
8. 8, 24, 48, 80, 120.
9. 11, 22, 44, 66, 88.
10. 18, 21, 49, 63, 84.
11. 9, 21, 49, 56, 70.
12. 105, 315, 693, 1287.

Third method. By the help of H.C.F.

Rule. To find the L.C.M. of two numbers, divide one of the numbers by their H.C.F. and then multiply the quotient by the other number.

Ex. 1. Find the L.C.M. of 3277 and 3503.

Sol. We first find the G.C.M of 3277 and 3503.

$$\begin{array}{l} 3277)3503(1 \\ \quad\;\; 3277 \\ \hline \quad\;\; 226)3277(14 \\ \qquad\quad\; 226 \\ \hline \qquad\quad\; 1017 \\ \qquad\quad\; 904 \\ \hline \qquad\quad\; 113)226\ (2 \\ \qquad\qquad\quad 226 \\ \hline \qquad\qquad\quad \times \end{array}$$

$\therefore$ G.C.M.$=113$.

Hence L.C.M.$=3277\div113\times3503=101587$. *Ans.*

To find the L.C.M. of more than two numbers.

Rule. First find the L.C.M. of any two of the given numbers ; then find the L C.M. of this L.C.M and the third number and so on. The last L.C.M. will be the required L.C.M.

Ex 2. Find the L.C.M. of 364, 2520 and 5265.

Sol. The G.C.M. of 364 and 2520 is 28.

$\therefore$ the L.C.M. of 364 and $2520=\frac{364}{28}\times2520=32760$.

Again the G.C.M. of 32760 and 5265 is 585.

The L.C.M. of 32760 and $5265=\frac{5265}{585}\times32760=294840$.

Hence the reqd. L.C.M. is 294840. *Ans.*

Exercise 15

Find the L.C.M. by the help of H.C.F. of :

1. 6693, 8439. **2.** 7163, 7429. **3.** 4375, 9625. **4.** 728, 5040, 10530.

---

8. Problems on L.C.M.

Rule. *The product of two numbers is equal to the product of their H.C.F. and L.C.M.*

Ex. 1. The H.C.F. of two numbers is 14 and their L.C.M. is 210. If one of them is 42, find the other.

Sol. The required number $\times 42 =$ H.C.F. $\times$ L.C.M. $= 14 \times 210 = 2940$.

$\therefore$ the required number $= 2940 \div 42 = 70$. *Ans.*

Ex. 2. Four bells ring simultaneously and afterwards at intervals of 3, 4, 5 and 6 seconds respectively. At what interval will they all ring together ?

Sol. Clearly all the four bells will ring together after an interval which is the least multiple of 3, 4, 5 and 6 seconds.

$$\begin{array}{r|l} 2 & 3,\ 4,\ 5,\ 6 \\ \hline 3 & 3,\ 2,\ 5,\ 3 \\ \hline & 1,\ 2,\ 5,\ 1 \end{array}$$

$\therefore$ the L.C.M. $= 2 \times 3 \times 2 \times 5 = 60$.

$\therefore$ the interval at which they will ring together $= 60$ seconds or 1 min. *Ans.*

Exercise 16

1. The L.C.M. of two numbers is 63 and their G.C.M. is 3. If one of the numbers be 21, find the other.

2. The H.C.F. of two numbers is 35 and their L.C.M. is 490. If one of them is 70, find the other.

3. The L.C.M. of two numbers is 2079 and their G.C.M. is 27. If one of the numbers is 189, find the other.

4. Five bells ring simultaneously and afterwards at intervals of 4, 6, 8, 10 and 12 minutes respectively. At what interval will they all ring together ?

5. Four bells toll simultaneously and afterwards at intervals of 3, 6, 9 and 12 seconds respectively. How often will they all toll together in one hour ?

Ex. 1 Find the least number which when divided by 8, 12, 16 and 24 leaves in each case the same remainder 5.

Sol. Clearly the required number must be greater by 5 than the L.C.M. of the given numbers.

$$\begin{array}{r|l} 2 & 8,\ 12,\ 16,\ 24 \\ \hline 2 & 4,\ 6,\ 8,\ 12 \\ \hline 2 & 2,\ 3,\ 4,\ 6 \\ \hline 3 & 1,\ 3,\ 2,\ 3 \\ \hline & 1,\ 1,\ 2,\ 1 \end{array}$$

$\therefore$ the L.C.M.$=2\times2\times2\times3\times2=48$.

$\therefore$ the reqd. number$=48+5=53$. *Ans.*

Ex. 2. Find the least number which when divided by 12, 15, 18 and 30 leaves the remainders 6, 9, 12 and 24 respectively.

Sol. Since $12-6=6$, $15-9=6$, $18-12=6$, $30-24=6$.

$\therefore$ the remainder in each case is less than the divisor by 6. Hence if 6 be added to the required number it becomes exactly divisible by 12, 15, 18 and 30.

$$\begin{array}{r|l} 2 & 12,\ 15,\ 18,\ 30 \\ \hline 2 & 6,\ 15,\ 9,\ 15 \\ \hline 5 & 2,\ 5,\ 3,\ 5 \\ \hline & 2,\ 1,\ 3,\ 1 \end{array}$$

$\therefore$ the L.C.M.$=2\times3\times5\times2\times3=180$.

$\therefore$ the reqd. number$=180-6=174$. *Ans.*

Ex. 3. Find the least number of 4 digits which is exactly divisible by 15, 25 and 30.

Sol.

$$\begin{array}{r|l} 3 & 15,\ 25,\ 30 \\ \hline 5 & 5,\ 25,\ 10 \\ \hline & 1,\ 5,\ 2 \end{array}$$

L.C.M.$=3\times5\times5\times2=150$.

Least number of 4 digits$=1000$.

Now, we have to find the least number of 4 digits exactly divisible by 150.

$$\begin{array}{r} 150)\overline{1000}(6 \\ 900 \\ \hline 100 \end{array}$$

$\therefore$ the number$=1000+(150-100)=1050$. *Ans.*

Exercise 17

1. Find the least number which when divided by 12, 15, 36 and 45 leaves in each case remainder 4.

2 Find the least number which when diminished by 9 is exactly divisible by 12, 16, 24 and 48.

3. Find the least number which when decreased by 3, is exactly divisible by 18, 24, 30 and 42.

4. Find the least number which when divided by 8, 12, 18, 21 and 24 leaves 2, 6, 12, 15 and 18 respectively as remainders.

5. Find the least number which when divided by 24, 36, 42 and 56 leaves 6, 18, 24 and 38 as remainders respectively.

6. Find the least number which when increased by 3 is exactly divisible by 9, 12, 15 and 21.

7. Find the least number of three digits which is exactly divisible by 4, 5, 8 and 20.

8. Find the least number of four digits which is exactly divisible by 2, 3, 4, 5, 6 and 7.

9. Find the greatest number of three digits which is exactly divisible by 3, 4, 6 and 10.

10. Find the greatest number of four digits which is exactly divisible by 24, 30, 32 and 36.

11. Find the least number of four digits which when divided by 4, 6, 8 and 10 leaves in each case a remainder 3.

12. Find the greatest number of four digits which on being divided by 2, 3, 4, 5 and 6 leaves 1, 2, 3, 4 and 5 as remainders respectively.

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5

Vulgar Fractions

1. If any unit be divided into any number of equal parts, one or more of these parts is called a **Fraction** (*Bhinn*).

If we divide a circular cake into four equal parts, *i.e.*, into **fourths,** then the shaded area in Fig. 1, Fig. 2 and Fig. 3 are respectively **called one-fourth,** two-fourths and three-fourths of the cake.

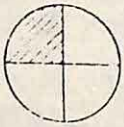


Fig. 1

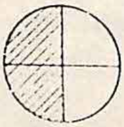


Fig. 2

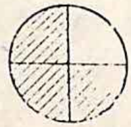


Fig. 3

The fractions one-fourth, two-fourths, three-fourths are respectively written as $\frac{1}{4}$, $\frac{2}{4}$, $\frac{3}{4}$. The fraction $\frac{1}{4}$ is read as 'one over four' or 'one upon four'.

A fraction is represented by two numbers, written one above the other and separated by a horizontal line. The two numbers are called the terms of the fraction.

The lower term of the fraction is called the **Denominator** (*Har*) and the upper term is called the **Numerator** (*Ansh*). Thus in the fraction $\frac{7}{9}$, 7 is the numerator and 9 is the denominator.

Now suppose *Re* 1 is divided into 5 equal parts. Clearly each part contains 20 *P* and three such parts will contain (3 × 20 *P*) or 60 *P*.

$\therefore$ $\frac{3}{5}$ of a rupee=60 *P*.

Also, if *Rs* 3 be divided into five equal parts, each part contains 60 *P*, *i.e.*, $\frac{3}{5}$ of a rupee=*Rs* 3÷5.

Hence a fraction may also be defined as the *quotient obtained on dividing the numerator by the denominator.*

Thus a fraction $\frac{4}{5}$ may also be read as 'four divided by five'.

Note 1. A fraction is equal to unity when its numerator is equal to its denominator *e.g.*, $\frac{7}{7}=1$.

Note 2. A fraction is equal to zero when its numerator alone is zero *e.g.*, $\frac{0}{7}$, $\frac{0}{100}$, $\frac{0}{1151}$, are all equal to zero. The denominator of a fraction is always assumed to be non-zero, *i.e*, a fraction having zero as denominator has no meaning.

Ex Find the value of $\frac{5}{8}$ of *Rs* 2·40.

Sol. $\frac{5}{8}$ of *Rs* 2·40 $= \frac{5}{8}$ of 240 $P = \frac{5 \times 240}{8}\ P = \frac{1200}{8}\ P = 150\ P = Rs\ 1{\cdot}50.$

Ans.

Exercise 18

Find the values of the following :

1. $\frac{4}{25}$ of a *kg*. **2.** $\frac{7}{9}$ of *Rs* 3·60. **3.** $\frac{3}{5}$ of 3 *kg* 50 *g*.

4. $\frac{11}{20}$ of a kilolitre. **5.** $\frac{9}{17}$ of 3 *m* 40 *cm*.

---

2. Kinds of fractions. Fractions are of two kinds :

(*i*) Vulgar fractions. (*ii*) Decimal fractions.

Vulgar fractions are those fractions whose denominators are any numbers other than ten or any power of ten. Thus $\frac{4}{7}$, $\frac{2}{9}$, $\frac{13}{8}$, etc., are vulgar fractions. These are also called **common fractions.**

Decimal fractions are those fractions whose denominators are ten or any power of ten and are expressed in decimal notation. Thus ·3, ·49, etc., are decimal fractions.

Note. Decimal fractions are particular form of vulgar fractions They have been explained in the next chapter.

3. Vulgar fractions may be proper or improper.

A **proper fraction** is that fraction in which the numerator is less than the denominator *e.g.*, $\frac{3}{7}$, $\frac{4}{11}$, $\frac{9}{19}$, etc.

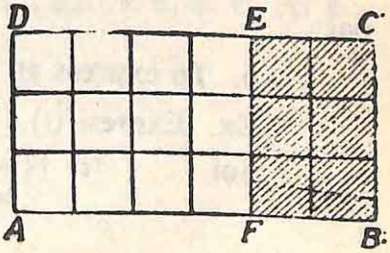
An **improper fraction** is that fraction in which the numerator is greater than the denominator *e.g.*, $\frac{38}{7}$, $\frac{35}{9}$, $\frac{42}{17}$ etc.

Again, vulgar fractions may be simple or complex.

A **simple fraction** is that fraction in which both the numerator and the denominator are simple whole numbers, *e.g.*, $\frac{5}{12}$, $\frac{17}{27}$, etc.

A **complex fraction** is that fraction in which numerator or denominator or both are fractions, *e.g.*, $\frac{3}{\frac{5}{7}}$, $\frac{\frac{3}{7}}{7}$, $\frac{\frac{2}{3}}{\frac{4}{11}}$, etc.

4. Reduction of Fractions



The adjoining rectangle ABCD has been divided into 18 equal parts. The shaded portion BCEF is $\frac{1}{3}$ of the whole rectangle and at the same time its $\frac{6}{18}$ also. Similarly, the unshaded portion AFED is $\frac{2}{3}$ of the whole and also its $\frac{12}{18}$.

Thus $\frac{1}{3} = \frac{6}{18} = \frac{1 \times 6}{3 \times 6}$

and $\frac{2}{3} = \frac{12}{18} = \frac{2 \times 6}{3 \times 6}.$

Again $\frac{6}{18}=\frac{6\div6}{18\div6}=\frac{1}{3}$ and $\frac{12}{18}=\frac{12\div6}{18\div6}=\frac{2}{3}$.

Hence the value of a vulgar fraction is not changed by multiplying or dividing the numerator and the denominator by the same number.

Def. When the numerator and the denominator of a fraction have no common factor, the fraction is said to be **in its lowest terms.**

Ex. 1. Reduce $\frac{42}{66}$ to its lowest terms.

Sol. $\frac{42}{66}=\frac{21}{33}$ [by dividing the terms by 2]

$=\frac{7}{11}$. *Ans.* [by dividing the terms by 3]

The above work is usually arranged as shown in the margin

$$\frac{\overset{\overset{7}{\cancel{21}}}{\cancel{42}}}{\underset{\underset{11}{\cancel{33}}}{\cancel{66}}}=\frac{7}{11}.\quad \textit{Ans.}$$

Ex. 2. Reduce $\frac{5786}{10783}$ to its lowest terms.

Sol. Here the terms are very large and their common factors cannot easily be found so we first find out their G C.M. and then divide them by the G.C.M.

5786)10783(1
5786
4997)5786(1
4997
789)4997(6
4734
263)789(3
789
×

G C.M. of 5786 and 10783 is 263.

$$\therefore \frac{5786}{10783}=\frac{5786\div263}{10783\div263}=\frac{22}{41}.\ \textit{Ans.}$$

Exercise 19

Reduce the following fractions to their lowest terms :

1. $\frac{24}{72}$, $\frac{36}{108}$, $\frac{39}{69}$.
2. $\frac{60}{96}$, $\frac{72}{144}$, $\frac{51}{85}$.
3. $\frac{148}{172}$, $\frac{250}{400}$, $\frac{34}{484}$.
4. $\frac{425}{625}$, $\frac{234}{286}$, $\frac{276}{292}$.
5. $\frac{625}{1250}$, $\frac{425}{725}$, $\frac{650}{675}$.
6. $\frac{288}{312}$, $\frac{323}{391}$, $\frac{1150}{3525}$.
7. $\frac{63}{135}$, $\frac{324}{612}$, $\frac{47}{235}$.
8. $\frac{231}{441}$, $\frac{625}{650}$, $\frac{480}{660}$.
9. $\frac{112}{364}$, $\frac{115}{355}$, $\frac{174}{222}$.
10. $\frac{1690}{1820}$, $\frac{1615}{1955}$, $\frac{1980}{2904}$.

---

5. **A mixed number** is one which consists of a whole number and a fraction, *e g.*, $1\frac{3}{4}$, $5\frac{2}{3}$, $7\frac{5}{12}$, etc.

In the mixed number, $5\frac{7}{9}$, 5 is the integral part, and $\frac{7}{9}$ is the fractional part.

6. **To express an improper fraction as a whole or a mixed number.**

Ex. Express (*i*) $\frac{37}{11}$ and (*ii*) $\frac{99}{9}$ as mixed numbers.

Sol. (*i*) $\frac{37}{11}=37\div11$.

$=3+\frac{4}{11}=3\frac{4}{11}$. *Ans.*

11)37(3
33
4

(*ii*) $\frac{99}{9}=99\div9$.

$=11$. *Ans.*

7. To express a mixed number as an improper fraction.

Ex. Express $5\frac{2}{3}$ as an improper fraction.

Sol. $5\frac{2}{3}=\dfrac{5\times3+2}{3}=\dfrac{15+2}{3}=\dfrac{17}{3}$ *Ans.*

Exercise 20

Express as mixed or whole numbers the following fractions :

1. $\frac{5}{3}, \frac{8}{5}, \frac{25}{4}$. **2.** $\frac{39}{13}, \frac{27}{11}, \frac{115}{16}$. **3.** $\frac{74}{23}, \frac{101}{71}, \frac{175}{83}$. **4.** $\frac{111}{28}, \frac{392}{123}, \frac{996}{249}$.

Express as improper fractions the following mixed numbers :

5. $3\frac{5}{8}, 7\frac{9}{11}, 5\frac{3}{13}$. **6.** $6\frac{9}{19}, 5\frac{13}{14}, 1\frac{3}{23}$.

7. $1\frac{18}{31}, 3\frac{4}{23}, 2\frac{1}{41}$. **8.** $15\frac{11}{13}, 19\frac{2}{21}, 21\frac{1}{25}$.

---

8. A given fraction can be expressed as another fraction of which the denominator is any multiple of the denominator of the given fraction.

Ex. Change $\frac{7}{13}$ into a fraction of which the denominator is 65.

Sol. $\because\ 65=13\times5 \quad \therefore\ \dfrac{7}{13}=\dfrac{7\times5}{13\times5}=\dfrac{35}{65}$. *Ans.*

9. Comparison of Fractions. If two or more fractions with different denominators are to be compared they must first be reduced to equivalent fractions whose denominators are equal to the L.C.M. of the denominators of the given fractions, then the greater is that which has the greater numerator.

Note. L.C.M. of the denominators is called their **least common denominator** (L.C.D.).

Ex. Arrange the fractions $\frac{2}{3}, \frac{3}{4}, \frac{1}{2}$ in ascending order of magnitude.

Sol. The L.C.M. of 3, 4, 2
$=2\times3\times2=12$

$$\begin{array}{r|l} 2 & 3,\ 4,\ 2 \\ \hline & 3,\ 2,\ 1 \end{array}$$

$$\frac{2}{3}=\frac{2\times4}{3\times4}=\frac{8}{12}\ ;\ \frac{3}{4}=\frac{3\times3}{4\times3}=\frac{9}{12}\ ;\ \frac{1}{2}=\frac{1\times6}{2\times6}=\frac{6}{12}.$$

Hence the order will be $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}$. *Ans.*

Exercise 21

Arrange in ascending order of magnitude the fractions :

1. $\frac{5}{14}, \frac{7}{9}, \frac{11}{18}$. **2.** $\frac{4}{5}, \frac{7}{15}, \frac{2}{3}, \frac{5}{6}$. **3.** $\frac{3}{7}, \frac{5}{6}, \frac{11}{14}, \frac{7}{12}$. **4.** $\frac{1}{4}, \frac{7}{8}, \frac{2}{5}, \frac{11}{16}, \frac{19}{20}$.

Arrange in descending order of magnitude the fractions :

5. $\frac{5}{9}, \frac{7}{11}, \frac{8}{27}, \frac{15}{22}$. **6.** $\frac{3}{4}, \frac{4}{5}, \frac{5}{8}, \frac{2}{3}, \frac{7}{16}$. **7.** $\frac{5}{7}, \frac{11}{14}, \frac{16}{21}, \frac{23}{42}, \frac{59}{84}$. **8.** $\frac{2}{5}, \frac{4}{9}, \frac{3}{2}, \frac{5}{11}, \frac{2}{5}$.

---

10. Addition of Fractions

Ex. Find the sum of $1\frac{2}{3}$, $3\frac{5}{8}$ and $5\frac{3}{4}$.

Sol. $1\frac{2}{3}+3\frac{5}{8}+5\frac{3}{4}$
$=\frac{5}{3}+\frac{29}{8}+\frac{23}{4}$
$=\dfrac{40+87+138}{24}$
$=\frac{265}{24}=11\frac{1}{24}$ *Ans.*

$$\begin{array}{r|l} 2 & 3,\ 8,\ 4 \\ \hline 2 & 3,\ 4,\ 2 \\ \hline & 3,\ 2,\ 1 \end{array}$$

$\therefore$ the L. C. M.$=2\times2\times3\times2=24$.

Exercise 22

Find the value of :

1. $\frac{3}{4}+\frac{1}{5}+\frac{7}{12}+\frac{11}{15}$. 2. $\frac{7}{8}+\frac{17}{24}+\frac{5}{16}+\frac{2}{3}$. 3. $\frac{7}{15}+\frac{4}{5}+\frac{6}{7}+\frac{11}{14}$.

4. $1\frac{2}{3}+2\frac{3}{5}+1\frac{1}{4}+3\frac{7}{8}$. 5. $1\frac{3}{4}+\frac{5}{24}+\frac{15}{8}+\frac{1}{3}$. 6. $2\frac{1}{7}+\frac{5}{28}+\frac{7}{12}+1\frac{3}{4}$.

7. $3\frac{2}{3}+1\frac{5}{6}+2\frac{11}{12}+\frac{7}{9}$. 8. $\frac{9}{4}+\frac{15}{12}+\frac{15}{8}+\frac{27}{16}$.

9. I read $15\frac{3}{4}$ pages of my book on Monday, $21\frac{5}{8}$ pages on Tuesday and $17\frac{2}{3}$ pages on Wednesday. Find the total number of pages I read in these days.

10. You read $25\frac{3}{4}$ pages of your book on 1st day, $23\frac{3}{8}$ pages on 2nd day and $37\frac{1}{2}$ pages on 3rd day. If the book contained 100 pages, how many pages are left over ?

---

11. Subtraction of Fractions

Ex. Subtract $13\frac{3}{5}$ from $21\frac{5}{8}$.

Sol. $21\frac{5}{8}-13\frac{3}{5}=\frac{173}{8}-\frac{68}{5}=\frac{865-544}{40}$

$=\frac{321}{40}=8\frac{1}{40}$. *Ans.*

The L.C.M. of 8 and 5 is 5×8 *i.e*, 40

Exercise 23

Find the value of :

1. $\frac{3}{5}-\frac{1}{2}$. 2 $\frac{7}{8}-\frac{3}{4}$. 3. $\frac{8}{21}-\frac{3}{14}$. 4. $7\frac{13}{14}-5\frac{2}{7}$.

5. $9\frac{7}{8}-7\frac{9}{16}$. 6. $65\frac{1}{9}-47\frac{1}{4}$. 7. $100-25\frac{7}{9}$. 8. $78\frac{3}{11}-47\frac{3}{13}$.

---

12. Addition and Subtraction of Fractions

Ex. Solve : $\frac{1}{4}-\frac{3}{8}+2\frac{1}{3}+1\frac{1}{6}-1\frac{3}{4}$.

Sol. $\frac{1}{4}-\frac{3}{8}+2\frac{1}{3}+1\frac{1}{6}-1\frac{3}{4}=\frac{1}{4}-\frac{3}{8}+\frac{7}{3}+\frac{7}{6}-\frac{7}{4}$

$$=\frac{6-9+56+28-42}{24}$$

$$=\frac{\overset{13}{\cancel{39}}}{\underset{8}{\cancel{24}}}=\frac{13}{8}$$

$$=1\frac{5}{8}.\quad \textit{Ans.}$$

$$\begin{array}{r|l}
2 & 4,\ 8,\ 3,\ 6,\ 4 \\ \hline
2 & 2,\ 4,\ 3,\ 3,\ 2 \\ \hline
3 & 1,\ 2,\ 3,\ 3,\ 1 \\ \hline
 & 1,\ 2,\ 1,\ 1,\ 1
\end{array}$$

$\therefore$ the L.C.M.
$=2\times2\times3\times2$
$=24$.

Exercise 24

Find the value of :

1. $\frac{1}{2}-\frac{1}{3}+\frac{1}{4}-\frac{1}{5}$. 2. $\frac{3}{5}-\frac{11}{12}+\frac{13}{16}-\frac{1}{8}$. 3. $\frac{19}{18}-\frac{23}{24}+2\frac{1}{30}-\frac{7}{12}$.

4. $1\frac{1}{2}-1\frac{1}{4}+2\frac{1}{6}-\frac{5}{24}$. 5. $3\frac{3}{4}+4\frac{5}{8}-6\frac{5}{8}+1\frac{7}{12}$. 6. $14\frac{7}{9}-8\frac{5}{18}-3\frac{3}{4}-1\frac{5}{6}$.

7. $3\frac{10}{11}+5\frac{15}{22}-2\frac{3}{8}-\frac{1}{4}-1\frac{1}{2}$. **8.** $2\frac{1}{5}+1\frac{4}{7}-4\frac{1}{2}-\frac{3}{5}+2\frac{8}{35}$.

9. What number added to $\frac{5}{7}+\frac{3}{4}$ will give $2\frac{5}{84}$?

10. Rama bought wheat worth *Rs* $25\frac{1}{4}$, ghee worth *Rs* $13\frac{3}{8}$ and spices worth *Rs* $2\frac{5}{16}$. He gave a hundred-rupee note to the shopkeeper. What amount should the shopkeeper return him ?

---

13. Multiplication of Fractions

Ex. 1. Multiply $\frac{3}{8}$ by 2.

Sol. $\frac{3}{8}\times 2=\frac{3}{\underset{4}{\cancel{8}}}\times\frac{\overset{1}{\cancel{2}}}{1}=\frac{3}{4}$. *Ans.*

Ex. 2. Multiply $5\frac{3}{4}$ by 3.

Sol. $5\frac{3}{4}\times 3=\frac{23}{4}\times\frac{3}{1}=\frac{69}{4}=17\frac{1}{4}$. *Ans.*

Ex. 3. Find the product of $2\frac{1}{3}$ and $1\frac{6}{7}$.

Sol. $2\frac{1}{3}\times 1\frac{6}{7}=\frac{\cancel{7}}{3}\times\frac{13}{\cancel{7}}=\frac{13}{3}=4\frac{1}{3}$. *Ans.*

Note. Express mixed numbers as improper fractions.

Ex. 4. Find the continued product of $\frac{7}{16}$, $\frac{24}{49}$ and $1\frac{13}{15}$.

Sol. $\frac{7}{16}\times\frac{24}{49}\times 1\frac{13}{15}=\frac{\cancel{7}}{\underset{\cancel{4}}{\cancel{16}}}\times\frac{\overset{\overset{2}{\cancel{6}}}{\cancel{24}}}{\underset{\cancel{7}}{\cancel{49}}}\times\frac{\overset{\cancel{4}}{\cancel{28}}}{\underset{5}{\cancel{15}}}=\frac{2}{5}$. *Ans.*

Exercise 25

Simplify :

1. $\frac{4}{9}\times 7$. **2.** $4\frac{5}{8}\times 18$. **3.** $3\frac{3}{17}\times 85$. **4.** $2\frac{1}{21}\times 84$.

5. $3\frac{5}{9}\times 3$. **6.** $\frac{5}{8}\times\frac{4}{7}$. **7.** $\frac{4}{15}\times\frac{25}{28}$. **8.** $1\frac{2}{9}\times\frac{27}{55}$.

9. $2\frac{3}{8}\times 1\frac{5}{17}$. **10.** $\frac{3}{8}\times\frac{5}{7}\times\frac{7}{9}$. **11.** $1\frac{2}{5}\times 5\frac{5}{7}\times 7\frac{7}{9}$. **12.** $1\frac{1}{2}\times 2\frac{2}{9}\times 2\frac{1}{4}\times 2\frac{1}{5}$.

13. Multiply the sum of $\frac{3}{4}$ and $\frac{7}{8}$ by the sum of $\frac{11}{13}$ and $\frac{5}{26}$.

14. What is the difference between $2\frac{1}{3}\times 24\frac{5}{7}$ and $2\frac{8}{11}\times 18\frac{1}{3}$?

15. What is the difference between 1 and $\frac{2}{3}\times\frac{15}{27}\times 1\frac{19}{26}$?

Division of Fractions

14. Division of a fraction by an integer.

Ex. Divide $\frac{2}{3}$ by 3.

Sol. $\frac{2}{3}\div\frac{3}{1}=\frac{2}{3}\times\frac{1}{3}=\frac{2}{9}$. *Ans.*

Def. If the numerator and denominator of a fraction be interchanged the fraction so formed is called the *reciprocal* of the original fraction. Thus $\frac{8}{5}$ is the reciprocal of $\frac{5}{8}$.

15. Division of a fraction by a fraction.

Ex. Divide $\frac{51}{65}$ by $1\frac{33}{35}$.

Sol. $\frac{51}{65} \div 1\frac{33}{35} = \frac{51}{65} \div \frac{68}{35} = \frac{\overset{3}{\cancel{51}}}{\underset{13}{\cancel{65}}} \times \frac{\overset{7}{\cancel{35}}}{\underset{4}{\cancel{68}}} = \frac{21}{52}$. *Ans.*

Exercise 26

Divide :

1. $\frac{5}{7}$ by 13.
2. $\frac{75}{31}$ by 15.
3. $18\frac{1}{3}$ by 11.
4. $11\frac{4}{7}$ by 27.
5. $\frac{7}{9}$ by $\frac{2}{3}$.
6. $\frac{5}{11}$ by $\frac{15}{22}$.
7. $2\frac{5}{7}$ by $7\frac{3}{5}$.
8. 6 by $3\frac{3}{5}$.
9. $9\frac{4}{5}$ by $11\frac{1}{3}$.
10. $26\frac{5}{6}$ by $12\frac{7}{9}$.
11. $17\frac{2}{7}$ by $8\frac{1}{17}$.
12. $21\frac{15}{16}$ by $\frac{1}{18}$.

---

16. Simplification of Fractions

Def. A fraction of a fraction is called a **Compound fraction.**

Thus $\frac{3}{5}$ of $\frac{11}{13}$ is a compound fraction.

$\frac{3}{5}$ of $\frac{11}{13}$ = 3 times of one-fifth of $\frac{11}{13} = \frac{3}{5} \times \frac{11}{13} = \frac{33}{65}$.

Hence 'of' means multiplication but it has the force of a bracket, *i.e.*, $\frac{1}{2} \div \frac{7}{15}$ of $\frac{8}{9} = \frac{1}{2} \div (\frac{7}{15} \times \frac{8}{9})$.

In simplifying fractions the word "**BODMAS**" should be remembered. It means—

First Remove brackets (B).
Second : Perform operations involving "*of*" (O).
Third : Perform operations involving "division" (D).
Fourth : Perform operations involving "multiplication" (M).
Fifth : Perform operations involving "addition" (A).
Sixth : Perform operations involving "subtraction" (S).

Ex. 1. Simplify : $2\frac{2}{5} \div \frac{3}{5}$ of $\frac{2}{5} + \frac{1}{2}$ of $\frac{3}{4} - 1\frac{35}{72}$.

Sol. The expression $= 2\frac{2}{5} \div \frac{3}{5}$ of $\frac{2}{5} + \frac{1}{2}$ of $\frac{3}{4} - 1\frac{35}{72}$

$= \frac{12}{5} \div \frac{3}{5}$ of $\frac{2}{5} + \frac{1}{2}$ of $\frac{3}{4} - \frac{107}{72} = \frac{12}{5} \div \frac{6}{25} + \frac{3}{8} - \frac{107}{72}$

[Working out 'of']

$$= \frac{\overset{2}{\cancel{12}}}{\cancel{5}} \times \frac{\overset{5}{\cancel{25}}}{\cancel{6}} + \frac{3}{8} - \frac{107}{72} \quad \text{[Working out } \div\text{]}$$

$$= \frac{10}{1} + \frac{3}{8} - \frac{107}{72} = \frac{720+27-107}{72} = \frac{\overset{80}{\cancel{640}}}{\underset{9}{\cancel{72}}} = \frac{80}{9} = 8\frac{8}{9}. \quad \textit{Ans.}$$

Ex. 2. Simplify : $3\frac{1}{3} + 5\frac{1}{4}$ of $\frac{2}{3} - \frac{7}{8} \div \frac{3}{4} + 1\frac{1}{2} \times 6\frac{4}{7} \div \frac{23}{14}$.

Sol. The given expression

$$=3\tfrac{1}{2}+5\tfrac{1}{4}\text{ of }\tfrac{2}{3}-\tfrac{7}{8}\div\tfrac{3}{4}+1\tfrac{1}{2}\times6\tfrac{4}{7}\div\tfrac{23}{14}$$

$$=\tfrac{7}{2}+\frac{\overset{7}{\cancel{21}}}{\underset{2}{\cancel{4}}}\text{ of }\frac{\overset{1}{\cancel{2}}}{\underset{1}{\cancel{3}}}-\tfrac{7}{8}\div\tfrac{3}{4}+\tfrac{3}{2}\times\tfrac{46}{7}\div\tfrac{23}{14}$$

$$=\tfrac{7}{2}+\tfrac{7}{2}-\tfrac{7}{8}\div\tfrac{3}{4}+\tfrac{3}{2}\times\tfrac{46}{7}\div\tfrac{22}{14}\qquad\text{[working out ‘of’]}$$

$$=\tfrac{7}{2}+\tfrac{7}{2}-\frac{7}{\underset{2}{\cancel{8}}}\times\frac{\overset{1}{\cancel{4}}}{3}+\frac{3}{\underset{1}{\cancel{2}}}\times\frac{\overset{2}{\cancel{46}}}{\underset{1}{\cancel{7}}}\times\frac{\overset{\overset{1}{\cancel{2}}}{\cancel{14}}}{\underset{1}{\cancel{23}}}\qquad\text{[working out ‘}\div\text{’]}$$

$$=\tfrac{7}{2}+\tfrac{7}{2}-\tfrac{7}{6}+6\qquad\text{[working out ‘}\times\text{’]}$$

$$=13-\tfrac{7}{6}\qquad\text{[working out ‘+’]}$$

$=11\frac{5}{6}$. *Ans.*

Exercise 27

Simplify :

1. $5\frac{1}{4}+2\frac{5}{6}\times1\frac{3}{5}-\frac{1}{3}$. 2. $5\frac{1}{4}\div\frac{3}{7}\times\frac{1}{2}$. 3. $5\frac{1}{4}\div\frac{3}{7}$ of $\frac{1}{2}$.
4. $10\frac{1}{8}$ of $\frac{24}{25}\div\frac{35}{36}$ of $\frac{24}{49}$. 5. $3\frac{1}{3}\div2\frac{1}{2}\times\frac{3}{4}\div\frac{1}{3}$ of $20\times\frac{7}{6}$.
6. $(1\frac{1}{5}\times5\frac{2}{3})\div(4\frac{3}{10}-1\frac{3}{4})$. 7. $3\frac{3}{10}\div(2\frac{1}{3}-1\frac{7}{8})$. 8. $5\frac{1}{2}+[\frac{5}{4}-(3\frac{1}{2}\times\frac{4}{7}-1\frac{1}{2})]$.
9. $\frac{1}{3}\div1\frac{1}{2}+\frac{5}{9}$ of $\frac{3}{4}-\frac{7}{12}\div\frac{7}{8}+\frac{5}{6}$. 10. $3\div1\frac{2}{3}$ of $\frac{2}{5}-\frac{5}{7}\times(\frac{7}{10}+4\frac{1}{5})$.

---

17. Complex fractions. As already defined a *complex fraction* is one in which the numerator or the denominator or both are fractions.

Thus $\dfrac{\frac{5}{6}}{7}$, $\dfrac{7}{\frac{14}{15}}$, $\dfrac{\frac{4}{5}}{\frac{2}{7}}$, $\dfrac{\frac{1}{2}+\frac{3}{3}}{\frac{4}{7}-\frac{5}{6}}$, etc., are complex fractions.

Note. The numerator is separated from the denominator by a thick line.

Ex. 1. Simplify :

(*i*) $\dfrac{\frac{5}{6}}{7}$, (*ii*) $\dfrac{7}{\frac{14}{15}}$, (*iii*) $\dfrac{\frac{4}{5}}{\frac{2}{7}}$, and (*iv*) $\dfrac{\frac{1}{2}+\frac{3}{8}}{\frac{4}{7}-\frac{5}{9}}$.

Sol. (*i*) $\dfrac{\frac{5}{6}}{7}=\frac{5}{6}\div7=\frac{5}{6}\times\frac{1}{7}=\frac{5}{42}$. *Ans.*

(*ii*) $\dfrac{7}{\frac{14}{15}}=7\div\frac{14}{15}=\overset{1}{\cancel{7}}\times\dfrac{15}{\underset{2}{\cancel{14}}}=\frac{15}{2}=7\frac{1}{2}$. *Ans.*

(*iii*) $\dfrac{\frac{4}{5}}{\frac{2}{7}}=\frac{4}{5}\div\frac{2}{7}=\dfrac{\overset{2}{\cancel{4}}}{5}\times\dfrac{7}{\cancel{2}}=\frac{14}{5}=2\frac{4}{5}$. *Ans.*

(*iv*) $\frac{\frac{1}{2}+\frac{3}{8}}{\frac{4}{7}-\frac{5}{9}}=\frac{\frac{4+3}{8}}{\frac{36-35}{63}}=\frac{\frac{7}{8}}{\frac{1}{63}}=\frac{7}{8}\times\frac{63}{1}=\frac{441}{8}=55\frac{1}{8}.$ *Ans.*

Note 1. In solving (*iv*) part above, we have first considered the humerators and the denominators as two different fractions and then simplified.

Note 2. In solving questions on simplification of complex fractions involving all signs, we remember the word 'BODMAS'.

Ex. 2. Simplify : $\frac{\frac{1}{2}+\frac{2}{5}}{\frac{2}{3}-\frac{1}{5}}.$

Sol. The given expression

$$=\frac{\frac{1}{2}+\frac{2}{5}}{\frac{2}{3}-\frac{1}{5}}=\frac{\frac{5+4}{10}}{\frac{10-3}{15}}=\frac{\frac{9}{10}}{\frac{7}{15}}=\frac{9}{\underset{2}{\cancel{10}}}\times\frac{\overset{3}{\cancel{15}}}{7}=\frac{27}{14}=1\frac{13}{14}.\qquad \textit{Ans.}$$

Ex. 3. Simplify :

$$\frac{1\frac{2}{3}\div 2\frac{1}{6}+1\frac{2}{5}\text{ of }1\frac{1}{4}-\frac{2}{13}}{\frac{5}{6}\times\frac{3}{2}-1\frac{7}{13}\text{ of }2\frac{2}{5}\div 1\frac{1}{3}+2\frac{1}{2}}$$

Sol. The numerator of the given expression

$$=\frac{5}{3}\div\frac{13}{6}+\frac{7}{5}\text{ of }\frac{5}{4}-\frac{2}{13}=\frac{5}{\underset{1}{\cancel{3}}}\times\frac{\overset{2}{\cancel{6}}}{13}+\frac{7}{\cancel{5}}\text{ of }\frac{\cancel{5}}{4}-\frac{2}{13}$$

$$=\frac{10}{13}+\frac{7}{4}-\frac{2}{13}=\frac{40+91-8}{52}=\frac{123}{52}.$$

The denominator of the given expression

$$=\frac{5}{\underset{2}{\cancel{6}}}\times\frac{\overset{1}{\cancel{3}}}{2}-\frac{\overset{4}{\cancel{20}}}{13}\text{ of }\frac{12}{\underset{1}{\cancel{5}}}\div\frac{4}{3}+\frac{5}{2}=\frac{5}{4}-\frac{\overset{12}{\cancel{48}}}{13}\times\frac{3}{\underset{1}{\cancel{4}}}+\frac{5}{2}$$

$$=\frac{5}{4}-\frac{36}{13}+\frac{5}{2}=\frac{65-144+130}{52}=\frac{51}{52}.$$

$\therefore$ given expression $=\frac{\frac{123}{52}}{\frac{51}{52}}=\frac{\overset{41}{\cancel{123}}}{\underset{1}{\cancel{52}}}\times\frac{\overset{1}{\cancel{52}}}{\underset{17}{\cancel{51}}}=\frac{41}{17}=2\frac{7}{17}.$ *Ans.*

Exercise 28

Simplify :

1. $\dfrac{6\frac{3}{4}-1\frac{3}{14}}{2\frac{1}{2}+1\frac{3}{7}}$.

2. $\dfrac{\frac{2}{3}+\frac{3}{4}-\frac{5}{6}}{\frac{4}{3} \text{ of } \frac{3}{4}\div 2\frac{2}{5}}$.

3. $\dfrac{6\frac{1}{12}+3\frac{7}{9} \text{ of } 1\frac{1}{17}-4\frac{1}{20}}{1\frac{1}{3}-1\frac{1}{8}\div\frac{81}{20}+4\frac{1}{9}}$.

4. $\dfrac{(5\frac{1}{2}-4\frac{3}{4})\div(6\frac{1}{4}-4\frac{3}{4})}{(4\frac{1}{2}+1\frac{1}{4})\times(1\frac{10}{23}-1\frac{1}{23})}$.

5. $\dfrac{(\frac{3}{4}+2\frac{2}{3})\times(1\frac{2}{3}-1\frac{4}{9})\div 1\frac{16}{25}}{(3\frac{1}{6}-2\frac{1}{3})\div(6\frac{1}{5}-4\frac{2}{3})\times 7\frac{2}{3}}$.

6. $\dfrac{\frac{4}{3} \text{ of } (2\frac{1}{5}-1\frac{1}{15})\times 1\frac{3}{5}\div(\frac{17}{18}+1\frac{2}{15})}{\frac{2}{7} \text{ of } (2\frac{3}{4}-2\frac{3}{5})\div 2\frac{2}{5} \text{ of } (1\frac{7}{12}-\frac{3}{4})}$.

7. $\dfrac{1\frac{2}{3}+\frac{3}{5}}{\frac{2}{3} \text{ of } 2\frac{1}{8}}+\dfrac{10-7\frac{1}{2}}{3\frac{1}{3}\times 1\frac{1}{5}}\times 1\frac{1}{15}$.

8. $7\frac{1}{2}-\frac{1}{9}\{3\frac{3}{4} \text{ of } \frac{2}{3}\ (\frac{1}{3}-\frac{1}{4}-\frac{1}{6})\}$.

9. $\dfrac{2 \text{ of } 2\div 2}{2\times 2\div 2}\div\dfrac{\frac{1}{2}\div\frac{1}{2} \text{ of } \frac{1}{2}}{\frac{1}{2} \text{ of } \frac{1}{2}\div\frac{1}{2}}$

10. $\dfrac{6\ 4\times 6{\cdot}4-3{\cdot}4\times 3{\cdot}4}{6{\cdot}4-3{\cdot}4}$.

---

18. Continued fractions

Fractions of the form

$$(i)\ 4+\cfrac{1}{3+\cfrac{1}{5+\frac{1}{2}}} \quad \text{or} \quad (ii)\ \cfrac{7}{1-\cfrac{2}{7+\cfrac{1}{3-\frac{1}{4}}}}$$

are called continued fractions.

19. Simplification of continued fractions.

Rule. To simplify a continued fraction, we begin at the bottom and work upwards.

Ex. 1. Simplify $\cfrac{1}{2+\cfrac{1}{3+\cfrac{1}{1+\frac{1}{4}}}}$

Sol. $$\cfrac{1}{2+\cfrac{1}{3+\cfrac{1}{1+\frac{1}{4}}}}=\cfrac{1}{2+\cfrac{1}{3+\cfrac{1}{\frac{5}{4}}}}=\cfrac{1}{2+\cfrac{1}{3+\frac{4}{5}}}=\cfrac{1}{2+\cfrac{1}{\frac{19}{5}}}$$

$$=\cfrac{1}{2+\frac{5}{19}}=\cfrac{1}{\frac{43}{19}}=\frac{19}{43}.\quad \textit{Ans.}$$

Exercise 29

Simplify the following fractions :

1. $\cfrac{1}{1+\cfrac{1}{1+\frac{4}{5}}}$. 2. $\cfrac{7}{3+\cfrac{1}{2-\frac{2}{3}}}$. 3. $1+\cfrac{2}{2+\cfrac{1}{1+\frac{1}{2}}}$.

4. $\dfrac{4}{7+\dfrac{1}{3-\frac{3}{4}}}$.   5. $\dfrac{1}{7+\dfrac{1}{6+\frac{1}{5}}}$.   6. $\dfrac{5}{3+\dfrac{3}{1-\frac{2}{3}}}$.

---

20. Simple Problems Involving Fractions.

Ex. 1. Express *Rs* 5·50 as a fraction of *Rs* 110.

First quantity $= Rs\ 5{\cdot}50 = 550\ P.$

Second quantity $= Rs\ 110 = 11000\ P.$

$$\therefore \text{ the reqd. fraction } = \frac{\overset{\cancel{11}}{\cancel{550}}}{\underset{\underset{20}{\cancel{220}}}{\cancel{11000}}} = \frac{1}{20}. \quad \textit{Ans.}$$

Ex. 2. My cow gives $10\frac{2}{5}$ litres of milk daily. Find the quantity of milk given in 8 days.

Sol. Milk given in one day $= 10\frac{2}{5}$ litres

„ „ 8 days $= 10\frac{2}{5} \times 8$ litres

$$= \frac{52}{5} \times \frac{8}{1} = \frac{416}{5} \text{ litres}$$

$$= 83\tfrac{1}{5} \text{ litres.} \quad \textit{Ans.}$$

Ex. 3. I read $\frac{3}{8}$ of a book on one day and $\frac{4}{5}$ of the remainder on another day. If there were now 30 pages left to be read, how many pages did the book contain.

Sol. Suppose the book contains 1 page.

The portion read on the first day $= \frac{3}{8}$.

Remaining portion $= 1 - \dfrac{3}{8} = \dfrac{8-3}{8} = \dfrac{5}{8}$.

The portion read on the other day $= \dfrac{\cancel{4}}{\cancel{5}}$ of $\dfrac{\cancel{5}}{\underset{2}{\cancel{8}}} = \dfrac{1}{2}$.

$\therefore$ the portion left unread $= \dfrac{5}{8} - \dfrac{1}{2} = \dfrac{5-4}{8} = \dfrac{1}{8}$.

Now $\frac{1}{8}$ of the book $=$ 30 pages.

$\therefore$ the book contains 30×8 or 240 pages. *Ans.*

Exercise 30

1. Express *Rs* 4·75 as a fraction of *Rs* 475.
2. Express 2 *kg* 800 *g* as a fraction of 8 *kg*.
3. Express 3 *km* 2 *hm* as a fraction of 25 *km* 6 *hm*.
4. Ram takes 25 minutes to complete $\frac{5}{8}$ of a journey. How long will he take to complete the whole journey at the same rate ?

5. It takes Mohan 48 minutes to do $\frac{3}{4}$ of a piece of work. How long will he take to complete half of the total work ?

6. It takes me $\frac{3}{5}$ hour to read $\frac{3}{4}$ of a book. How long will it take me to read the whole book ?

7. A wire paper clip is made from $5\frac{1}{2}$ *cm* of wire. Find how many clips can be made from 1 metre roll of wire, and also the length of the remaining piece.

8. From a rope 44 *m* long, as many pieces as possible are cut off, each $5\frac{1}{6}$ *m* long. Find the number of pieces and the length of the remaining rope.

9. After taking out of a purse $\frac{1}{5}$ of its contents, $\frac{1}{12}$ of the remainder was found to be *Rs* 7. 40 *P*. What sum did the purse contain at first ?

10. Out of a certain sum of money, a boy spends $\frac{4}{5}$ and then $\frac{1}{4}$ of the remainder. He has *Rs* 2·25 left. What had he at first ?

11 Subhash bought a bundle of sticks. He gave $\frac{1}{4}$ of the sticks to Ram and $\frac{3}{4}$ of the remainder to Anil. He had then 48 sticks left. Find the number of sticks the bundle contained at first.

12. A man gives $\frac{1}{2}$ of his capital to his son, $\frac{1}{3}$ of the remainder to his daughter and the remainder to his wife. If his wife receives *Rs* 365, find the capital of that man.

13. Hari does $\frac{3}{4}$ of a journey by rail, $\frac{1}{4}$ of the remainder by scooter, $\frac{2}{3}$ of the remainder by tonga and the remaining journey on foot. If he goes 13 *km* on foot, find the total journey that he does.

14. In a class $\frac{2}{3}$ of the students take French, $\frac{1}{8}$ of them take Latin and $\frac{1}{5}$ of the remainder take Hindi. Find the number of students in the class if 10 boys take Hindi.

□

6

Decimal Fractions

1. You are already familiar with the decimal system of notation. Here we will tell you something more about decimals.

2. A Decimal Fraction

A decimal fraction or a decimal is a fraction which has 10 or any power of 10 for its denominator, and is expressed in the decimal system of notation.

15·473 is read as 'fifteen point (or decimal) four, seven, three'. It has three decimal places. Also, 15 is the integral part, and ·473 is the decimal part.

3. To reduce any decimal to a vulgar fraction.

Ex. Express 6·875 as a vulgar fraction.

Sol. $6{\cdot}875=6\frac{\overset{\overset{\overset{7}{\cancel{35}}}{\cancel{175}}}{\cancel{875}}}{\underset{\underset{\underset{8}{\cancel{40}}}{\cancel{200}}}{\cancel{1000}}}=6\frac{7}{8}.$ *Ans.*

Note : *The following simple results may be remembered* :

$\cdot 5=\frac{1}{2}$. $\cdot 24=\frac{1}{4}$. $\cdot 75=\frac{3}{4}$. $\cdot 125=\frac{1}{8}$. $\cdot 375=\frac{3}{8}$. $\cdot 625=\frac{5}{8}$.

Exercise 31

Express as vulgar fractions in their lowest terms :

1. ·0375. **2.** ·0625. **3.** ·3125. **4.** ·0008. **5.** 8·128. **6.** 2·064.

---

4. Effect of zeros on decimals. We know that

(*i*) $\cdot 20=\frac{20}{100}=\frac{2}{10}=\cdot 2$.

(*ii*) $\cdot 650=\frac{650}{1000}=\frac{65}{100}=\cdot 65$.

(*iii*) $\cdot 8430=\frac{8430}{10000}=\frac{843}{1000}=\cdot 843$, and so on.

Hence from the above examples, we have the following

Result. The value of a decimal is not changed by affixing zeros to the right of the last figure.

Note. By the above result it is clear that any integer can be expressed as decimal by writing zeros in the decimal part. Thus 62=62·0=62·00, etc.

Again ·1=$\frac{1}{10}$ or one-tenth.
·01=$\frac{1}{100}$ or one-hundredth.
·001=$\frac{1}{1000}$ or one-thousandth, and so on.

Hence from these examples, we have the following

Result. The value of a decimal decreases ten times for every zero placed to the left of the first figure.

5. Addition of decimals.

Ex. Add together 5·406, 0·8, 100·008 and 56.

$$\begin{array}{r} 5{\cdot}406\\ 0{\cdot}8\\ 100{\cdot}008\\ 56\phantom{{\cdot}008}\\ \hline 162{\cdot}214 \end{array}\quad \textit{Ans.}$$

Sol.

Exercise 32

Add together :

1. 1·2, 2·1, 0·1. **2.** 1·23, 23, 3·001. **3.** 0·007, 14, 71·876.
4. 60·06, ·0135, 47·987. **5.** 271·163, 50·008, 4, 0·9801.

---

6. Subtraction of decimals.

Ex. Subtract 45·789 from 201·3.

Sol.

$$\begin{array}{r} 201{\cdot}300\\ 45{\cdot}789\\ \hline 155{\cdot}511\\ \hline \end{array}\quad \textit{Ans.}$$

Exercise 33

Subtract :

1. 4·321 from 27·123. **2.** 9·067 from 51·012.
3. 21·345 from 100. **4.** 99·001 from 1000.
5. What number added to 364·0356 gives 1000 ?
6. Subtract from 200 the sum of 53·4, 43·5, 3·001, 80·1 and 3·003.

---

7. Multiplication of decimals.

(*a*) To multiply by 10, 100, 1000, etc.

Ex. 1. Multiply 376·049 by 10, 100, 1000.

Sol

$$\left.\begin{array}{l} 376{\cdot}049\times10=3760{\cdot}49\\ 376{\cdot}049\times100=37604{\cdot}9\\ 376{\cdot}049\times 1000=376049 \end{array}\right\}\quad \textit{Ans.}$$

Ex. 2. Multiply 0·0039 by 10, 100, 1000.

Sol.

$$\left.\begin{array}{l} 0{\cdot}0039\times 10=00{\cdot}039 \text{ } i.e., \text{ } 0{\cdot}039 \\ 0{\cdot}0039\times 100=000{\cdot}39 \text{ } i.e., \text{ } 0{\cdot}39 \\ 0{\cdot}0039\times 1000=0003{\cdot}9 \text{ } i.e., \text{ } 3{\cdot}9 \end{array}\right\} \textit{Ans.}$$

(b) To multiply a decimal by a whole number.

Ex. Multiply 5·048 by 37.

Sol.

$$5048\times 37=186776$$

$$\therefore \quad 5{\cdot}048\times 37=186{\cdot}776 \quad \textit{Ans.}$$

$$\begin{array}{r} 5048 \\ 37 \\ \hline 35336 \\ 15144 \\ \hline 186776 \end{array}$$

(c) To multiply a decimal fraction by another decimal fraction.

Ex. Multiply 3·805 by 1·67.

Sol.

$$3805\times 167=635435$$

$$\therefore \quad 3{\cdot}805\times 1{\cdot}67=6{\cdot}35435. \quad \textit{Ans.}$$

$$\begin{array}{r} 3805 \\ 167 \\ \hline 26635 \\ 22830 \\ 3805 \\ \hline 635435 \end{array}$$

Exercise 34

Multiply :

1. ·35 by 10, 100, 1000. **2.** ·00342 by 1000, 100000. **3.** ·273 by 70400.

4. ·0368 by 15, 99. **5.** 1·5 by 1·5. **6.** 1·87 by 1·21.

7. 1·123 by 1·17. **8.** 3·414 by 3·41.

9. Find the value of $(3{\cdot}48+1{\cdot}72)(4{\cdot}31+1{\cdot}52)$.

10. Taking 1 *km*=0·6214 mile, express 17·5 *km* in miles.

---

8. Division of decimals.

(1) When the divisor is 10, 100, 1000, etc.

Ex. Divide 567·3 by 10, 100, 1000.

Sol.

$$\left.\begin{array}{l} (i)\ 567{\cdot}3\div 10=56{\cdot}73 \\ (ii)\ 567{\cdot}3\div 100=5{\cdot}673 \\ (iii)\ 567{\cdot}3\div 1000={\cdot}5673. \end{array}\right\} \textit{Ans.}$$

(2) When the divisor is a whole number.

Ex. 1. Divide (*i*) 10·72 by 8. (*ii*) 2·241 by 27. (*iii*) ·022 by 25.

Sol. (*i*)

$$\begin{array}{r} 1{\cdot}34 \\ 8)\overline{10{\cdot}72} \\ 8\phantom{{\cdot}72} \\ \hline 27 \\ 24 \\ \hline 32 \\ 32 \\ \hline \times \end{array}$$

$$\therefore \quad 10{\cdot}72\div 8=1{\cdot}34 \quad \textit{Ans.}$$

(*ii*)

$$\begin{array}{r} 0{\cdot}083 \\ 27)\overline{2{\cdot}241} \\ 2\,16 \\ \hline 81 \\ 81 \\ \hline \times \end{array}$$

$$\therefore \quad 2{\cdot}241\div 27=0{\cdot}083. \quad \textit{Ans.}$$

(*iii*)

∴ $\cdot022 \div 25 = \cdot00088$. *Ans.*

$$
\begin{array}{r}
\cdot00088 \\
25)\overline{\cdot02200} \\
200 \\
\hline
200 \\
200 \\
\hline
\times
\end{array}
$$

Note. Here we notice that the division of 22 by 25 is not exact and hence we add two zeros to the right of the dividend to make it exactly divisible by 25.

Ex. 2. Divide 58 67 by 3

Sol.

$$
\begin{array}{r}
19\cdot5566 \\
3)\overline{58\cdot6700} \\
3 \\
\hline
28 \\
27 \\
\hline
16 \\
15 \\
\hline
17 \\
15 \\
\hline
20 \\
18 \\
\hline
20 \\
18 \\
\hline
2
\end{array}
$$

Here the division does not terminate.

∴ the answer correct to three decimal places $= 19\cdot557$. *Ans.*

∴ $58\cdot67 \div 3 = 19\cdot5566$.

(3) When the divisor is a decimal.

Ex. 3. Divide 32·5 by ·0064.

Sol.

$$
\begin{aligned}
32\cdot5 \div \cdot0064 &= \frac{32\cdot5}{\cdot0064} \\
&= \frac{32\cdot5 \times 10000}{\cdot0064 \times 10000} \\
&= \frac{325000}{64} \\
&= 5078\cdot125 \text{ } \textit{Ans.}
\end{aligned}
$$

$$
\begin{array}{r}
5078\cdot125 \\
64)\overline{325000\cdot000} \\
320 \\
\hline
500 \\
448 \\
\hline
520 \\
512 \\
\hline
80 \\
64 \\
\hline
160 \\
128 \\
\hline
320 \\
320 \\
\hline
\times
\end{array}
$$

6. The remainder in division of decimals.

If the original dividend and divisor have been multiplied by the same number, the remainder obtained must be divided by the *same number* in order to obtain the true remainder.

Ex. How many pieces each 2·13 *dm* long can be cut from a rod 7 metres long ; and what will be the length of the remaining piece ?

Sol. 7 metres$=70$ *dm*

$$70\div 2{\cdot}13=\frac{70}{2{\cdot}13}=\frac{70\times 100}{2{\cdot}13\times 100}=\frac{7000}{213}$$

$$\begin{array}{r} 32\\ 213\overline{)7000}\\ \underline{639}\\ 610\\ \underline{426}\\ 184\end{array}$$

$\therefore$ No. of pieces$=32$.

Length of remaining piece$=\frac{184}{100}$ *dm*$=1{\cdot}84$ *dm*.

Exercise 35

Divide :

1. 28·9 by 17.
2. 62·5 by 25.
3. ·457263 by 18.
4. ·216 by 25.
5. 64 by 800.
6. 25·23 by 2900.
7. 36 by ·0018.
8. 6·82 by ·0125.
9. 64 by ·008.
10. 1·69 by 1·3.
11. 3·375 by 2·25.
12. ·1 by ·0005.
13. ·1 by 5000.

Find the quotient to 3 places of decimals :

14. $\cdot 5\div\cdot 71$.
15. $4{\cdot}321\div\cdot 77$.
16. $8000\div\cdot 123$.
17. $5{\cdot}002\div\cdot 00078$.

18. A wire paper clip is made from 2·85 *cm* of wire. Find how many such clips can be made from 180 *cm* roll of wire, and find the length of the remaining piece.

19. A copper wire is 400 *cm* long. Find how many pieces each 12·7 *cm* long can be cut from it, and find what length remains.

20. A box of screws weighs 13·5 *kg*. Each screw weighs 24 *g* and the weight of the box alone is 420 *g*. Find the number of screws in the box.

---

10. Approximation. Let the accurate value of a certain decimal be ·3468 which lies between ·346 and ·347. Since (·347−·3468=·0002) is less than (·3468−·346=·0008), ·347 is nearer to ·3468 than ·346.

Thus if we wish to represent ·3468 as nearly as possible with three decimal figures only, we must take ·347 for it.

The modified fraction, *i.e.*, ·347 is said to be *correct to the third decimal place*.

Again, let the accurate value of a certain decimal be ·3463 which lies between ·346 and ·347. Here since (·3463−·346=·0003) is less than (·347−·3463 =·0007), ·346 is **nearer** to ·3463 than ·347.

Thus, if we wish to represent ·3463 as nearly as possible with three decimal places, we must take ·346 for it.

The modified fraction, *i.e.*, ·346 is said to be *correct to the third decimal place.*

·3465 is as near to ·347 as it is to ·346, difference in each case being ·0005. Hence the value of ·3465 correct to three decimal places may be ·346 or ·347. But it is customary to represent ·34657 by ·347 and not by ·346.

Thus, it is clear that the value of a decimal correct to a certain specified place can be obtained by the following

Rule. Increase the last figure retained by 1, if the succeeding figure be 5 or greater than 5.

Note. The difference between "to three decimal places" and "correct to three decimal places" should be noted carefully, *e.g.*, the decimal ·3468 "to three decimal places" is expressed by ·346 but "correct to three decimal places", it is expressed by ·347.

Decimals which are correct to **one, two, three** places are said to be correct to the nearest **tenth, hundredth, thousandth**..........respectively.

Ex. 1. Find the sum of 37·775544, 5·2216, ·005891 and 1·1236 correct to three decimal places.

Sol. First we find the sum as in case of ordinary decimals.

$$\begin{array}{r} 37{\cdot}775544 \\ 5{\cdot}2216 \\ {\cdot}005891 \\ 1{\cdot}1236 \\ \hline 44{\cdot}126635 \end{array}$$

Hence correct to three decimals, the sum becomes 44·127. *Ans.*

Ex. 2. Multiply 137·0052 by ·123 and find the answer correct two decimal places.

Sol. First multiply as in the case of ordinary decimals.

$1370052 \times 123 = 168516396$

$\therefore\ 137{\cdot}0052 \times 123 = 16{\cdot}8516396$

Hence correct to two decimal places, the product becomes 16·85. *Ans.*

$$\begin{array}{r} 1370052 \\ 123 \\ \hline 4110156 \\ 2740104 \\ 1370052 \\ \hline 168516396 \end{array}$$

Ex. 3. Find the value of 850·37159 ÷ 412·31 correct to two decimal places.

Sol. Since there are two decimal places in the divisor, so we shift the decimal of the dividend to two places towards the right and then divide.

Hence correct to two decimal places the quotient is 2·06. *Ans.*

$$\begin{array}{r} 41231)85037{\cdot}159(2{\cdot}062 \\ 82462 \\ \hline 257515 \\ 247386 \\ \hline 101299 \\ 82462 \\ \hline 18837 \end{array}$$

Exercise 36

1. Find the sum of 8·765, 5·3031, 6·7 and 7·985001 correct of three places of decimals.

2. Find the value of 555·44 + 99·333 + 331·56701789 correct to five places of decimals.

3. Find the difference of 13·678901 and 4·00907 correct to two places of decimals.

4. Find the value of 543·567 − 77·449872 to the nearest thousandth.

5. Find the value of 15·73 × 14·721 to two decimal places.

6. Find the product of 13·4287 and ·7392 to two places of decimals.

7. Multiply 246·9254 by ·008729 and express the result correct to 3 decimal places.

8. Divide 7·3461 by 11·75 correct to 3 decimal places.

9. Find the value of 7 06 ÷ ·0067 to two decimal places.

10. Find the value of 782·345 ÷ 10·07 correct to 3 decimal places.

---

11. To reduce a vulgar fraction to a decimal.

Rule. Reduce the given vulgar fraction to its lowest terms, and then divide the numerator by the denominator.

Ex. 1. Reduce (*i*) $\frac{5}{8}$ and (*ii*) $5\frac{3}{25}$ to decimals.

Sol. (*i*) $\begin{array}{r} 0{\cdot}625 \\ 8\overline{)5{\cdot}000} \\ 48 \\ \hline 20 \\ 16 \\ \hline 40 \\ 40 \\ \hline \times \end{array}$

$\therefore\ \frac{5}{8}=0{\cdot}625.$ *Ans.*

(*ii*) $\begin{array}{r} 0{\cdot}12 \\ 25\overline{)3{\cdot}00} \\ 25 \\ \hline 50 \\ 50 \\ \hline \times \end{array}$

$\frac{3}{25}=0{\cdot}12$

$\therefore\ 5\frac{3}{25}=5{\cdot}12.$ *Ans.*

Ex. 2. Express $\frac{5}{12}$ as a decimal as far as the 4th decimal place.

Sol. $\begin{array}{r} 0{\cdot}4166 \\ 12\overline{)5{\cdot}0000} \\ 48 \\ \hline 20 \\ 12 \\ \hline 80 \\ 72 \\ \hline 80 \\ 72 \\ \hline 8 \end{array}$

$\therefore\ \frac{5}{12}=0{\cdot}4166.$ *Ans.*

Ex. 3. Express $\frac{17}{22}$ as a decimal correct to three decimal places.

Sol. $\begin{array}{r} 0{\cdot}7727 \\ 22\overline{)17{\cdot}0000} \\ 154 \\ \hline 160 \\ 154 \\ \hline 60 \\ 44 \\ \hline 160 \\ 154 \\ \hline 6 \end{array}$

$\therefore\ \frac{17}{22}=0{\cdot}7727$
$=0{\cdot}773.$ *Ans.*

Exercise 37

Reduce the following fractions to decimals :

1. $\frac{1}{2}$.
2. $\frac{3}{8}$.
3. $\frac{5}{16}$.
4. $\frac{3}{25}$.
5. $\frac{4}{125}$.
6. $\frac{239}{6250}$.
7. $6\frac{73}{128}$.
8. $\frac{129}{64}$.

Express the following as decimals correct to three decimal places :

9. $\frac{11}{29}$. **10.** $\frac{1}{13}$. **11.** $\frac{18}{23}$. **12.** $\frac{19}{22}$. **13.** $\frac{17}{11}$.

Express the following as decimals as far as the fourth decimal place :

14. $\frac{15}{22}$. **15.** $\frac{1}{7}$.

----

12. Decimalisation of compound quantities.

(I) Compound quantities which are based on the decimal system, *e.g.*, coinage system, metric system, etc., are easy to decimalise.

Ex. 1. Express *Rs* 12·25 *P* as a decimal of *Rs* 25.

Sol. First quantity = *Rs* 12·25
Second quantity = *Rs* 25.

$$\begin{array}{rr} & 0{\cdot}49 \\ \cline{2-2} 25) & 12{\cdot}25 \\ & 100 \\ \cline{2-2} & 225 \\ & 225 \\ \cline{2-2} & \times \end{array}$$

$\therefore$ the reqd. fraction $= \dfrac{Rs\ 12{\cdot}25}{Rs\ 25}$
$= 0{\cdot}49.$

Ex. 2. Express 3 metres 75 centimetres as a decimal fraction.

Sol. $3\ m\ 75\ cm = 3\frac{75}{100} m = 3\frac{3}{4}\ m = 3{\cdot}75\ m.$ *Ans.*

Ex. 3. Express 5 *km* 5 *hm* 2 *dam* 3 *m* as the decimal of a *km*.

Sol. $5\ km\ 5\ hm\ 2\ dam\ 3\ m = 5523\ m = (5523 \div 1000)\ km = 5{\cdot}523\ km.$

$\therefore$ the reqd. decimal $= \dfrac{5{\cdot}523\ km}{1\ km} = 5{\cdot}523.$ *Ans.*

(II) Compound quantities which are not based on the decimal system should be reduced to decimals as follows :

Express the lower denomination as a fraction of the highest denomination. Then convert the fraction into a decimal.

Exercise 38

Express as decimal of *Re* 1 :

1. 2 *P*. **2.** 60 *P*. **3.** *Rs* 3. 80 *P*.

4. Decimalise 5 *kg* 4 *hg* 3 *g*. **5.** Decimalise 4 *km* 50 *m*.

Express as decimal of 1 *kg* :

6. 6 *dag* 5 *g*. **7.** 150 *g* 5 *dg*. **8.** 15 *g* 15 *mg*.

Express as decimal of 1 *km* :

9. 11 *m* 7 *dm*. **10.** 507 *cm*. **11.** 805 *mm*.

12. Express 2 *m* 5 *cm* as a decimal of 1 *m*.

13. Reduce *Rs* 15. 25 *P* to the decimal of *Rs* 25.

14. Reduce *Rs* 8·40 to the decimal of *Rs* 14. 30 *P* correct to two decimal places.

15. Reduce 5 *m* 6 *dm* 7 *cm* as decimal of 15 *m*.

☐

7

Square Root

1. The square root of a number is that number whose square is equal to the given number.

For example, 9 is the square root of 81, because $9 \times 9 = 81$.

The symbol $\surd$, or $\sqrt{\quad}$ is called the **radical sign.** It is used to denote the square root of a number.

Thus $\sqrt{81} = 9$, $\sqrt{144} = 12$.

Note 1. Sometimes the word 'root' is used in place of 'square root'.

Note. 2. The square root of 1 is 1.

The following square and square root tables should be learnt thoroughly.

$\therefore 1^2 = 1 \quad \therefore \sqrt{1} = 1 \qquad \because 11^2 = 121 \quad \therefore \sqrt{121} = 11$

$\because 2^2 = 4 \quad \therefore \sqrt{4} = 2 \qquad \because 12^2 = 144 \quad \therefore \sqrt{144} = 12$

$\because 3^2 = 9 \quad \therefore \sqrt{9} = 3 \qquad \because 13^2 = 169 \quad \therefore \sqrt{169} = 13$

$\because 4^2 = 16 \quad \therefore \sqrt{16} = 4 \qquad \because 14^2 = 196 \quad \therefore \sqrt{196} = 14$

$\because 5^2 = 25 \quad \therefore \sqrt{25} = 5 \qquad \because 15^2 = 225 \quad \therefore \sqrt{225} = 15$

$\because 6^2 = 36 \quad \therefore \sqrt{36} = 6 \qquad \because 16^2 = 256 \quad \therefore \sqrt{256} = 16$

$\because 7^2 = 49 \quad \therefore \sqrt{49} = 7 \qquad \because 17^2 = 289 \quad \therefore \sqrt{289} = 17$

$\because 8^2 = 64 \quad \therefore \sqrt{64} = 8 \qquad \because 18^2 = 324 \quad \therefore \sqrt{324} = 18$

$\because 9^2 = 81 \quad \therefore \sqrt{81} = 9 \qquad \because 19^2 = 361 \quad \therefore \sqrt{361} = 19$

$\because 10^2 = 100 \quad \therefore \sqrt{100} = 10 \qquad \because 20^2 = 400 \quad \therefore \sqrt{400} = 20$

2. Methods of finding square root of a number.

I. The Factor Method

Ex. 1. Find, by factors, the square root of 1764.

$$\begin{array}{r|r} 2 & 1764 \\ \hline 2 & 882 \\ \hline 3 & 441 \\ \hline 3 & 147 \\ \hline 7 & 49 \\ \hline 7 & 7 \\ \hline & 1 \end{array}$$

Sol. $1764 = 2 \times 2 \times 3 \times 3 \times 7 \times 7$

$= 2^2 \times 3^2 \times 7^2$

$\therefore \sqrt{1764} = \sqrt{2^2 \times 3^2 \times 7^2}$

$= 2 \times 3 \times 7$

$= 42.$ *Ans.*

Note. To make a given number a perfect square, which is not a perfect square, we multiply or divide that number by those factors which do not occur in pairs.

$$\begin{array}{r|r} 2 & 294 \\ \hline 3 & 147 \\ \hline 7 & 49 \\ \hline 7 & 7 \\ \hline & 1 \end{array}$$

Ex. 2. Find the least number by which 294 should be multiplied or divided to make it a perfect square.

Sol. $294=2\times3\times7\times7$

Evidently the least number by which 294 should be multiplied or divided is $2\times3=6$. *Ans.*

II. Method of division

$$\begin{array}{r|l} & \;4\;\;\;2\;\;\;5 \\ \hline 4 & \overline{18}\;\overline{06}\;\overline{25} \\ & 16 \\ \hline 82 & \;\;206 \\ & \;\;164 \\ \hline 845 & \;\;4225 \\ & \;\;4225 \\ \hline & \;\;\;\times \end{array}$$

Ex. 3. Find the square root of 180625.

$\therefore\ \sqrt{\overline{18}\overline{06}\overline{25}}=425$. *Ans.*

(*i*) The root nearest to that of the first period 18 is 4. The square of 4 is 16. Subtracting 16 from 18, the remainder is 2. We bring down the next period, and we get 206 for the next dividend.

(*ii*) The **trial divisor** is 2×4, or 8, and the **trial dividend** is 20 The quotient is 2. We place 2 as the second digit in the root, and we also annex 2 to the trial divisor.

(*iii*) In the next step the **trial divisor** is 84, obtained by doubling the 42 in the root ; and the **trial dividend** is 422. The quotient is 5 ; hence 5 is the last digit of the root.

Exercise 39

Find, by the method of prime factors, the square root of :

1. 1024. **2.** 1849. **3.** 43264. **4.** 194481.

Find by the method of division the square root of :

5. 64009. **6.** 226576. **7.** 207936. **8.** 452929.

9. 546121. **10.** 1121481.

11. Find the smallest number by which 216 be multiplied or divided to make it a perfect square.

12. By what least number must 891 be multiplied or divided in order to make it a perfect square ?

13. By what least number must 35280 be multiplied or divided to make it a perfect square ?

14. A man plants his orchard with 5625 trees, and arranges them so that there are as many rows as there are trees in a row ; how many rows were there ?

15. A society collected *Rs* 29. 16 *P*, each member contributing as many paise as there were members. How many members were there ?

3. Square root of a decimal fraction.

$\because \cdot 1\times\cdot 1=\cdot 01 \quad \therefore \sqrt{\cdot 01}=\cdot 1 \quad \because \cdot 5\times\cdot 5=\cdot 25 \quad \therefore \sqrt{\cdot 25}=\cdot 5.$

$\because \cdot 02\times\cdot 02=\cdot 0004 \quad \therefore \sqrt{\cdot 0004}=\cdot 02 \quad \because 1\cdot 3\times 1\cdot 3=1\cdot 69 \quad \therefore \sqrt{1\cdot 69}=1\cdot 3$

From the above examples, it is clear that :

(*i*) The square root of any decimal fraction must always contain an **even** number of decimal places.

(*ii*) The number of places in the square root of a decimal fraction will be half the number of places in the number.

Hence to find the square root of a decimal fraction we have the following

Rule. Mark off periods of two digits to the right **starting from the decimal point** in the decimal part of the given fraction and towards the left in the integral part. Then find out the square root as in ordinary case. Each period will give one digit to the square root.

Ex. 1. Find the square root of :

(*i*) ·5184. (*ii*) 42·25.

Sol. (*i*)

$$\begin{array}{r|l} & \cdot 7\ \ 2 \\ \hline 7 & \overline{\cdot 51}\ \overline{84} \\ & 49 \\ \hline 142 & 284 \\ & 284 \\ \hline & \times \end{array}$$

$\therefore \sqrt{\cdot 5184}=\cdot 72.$ *Ans.*

(*ii*)

$$\begin{array}{r|l} & 6\cdot 5 \\ \hline 6 & \overline{42}\cdot\overline{25} \\ & 36 \\ \hline 125 & 625 \\ & 625 \\ \hline & \times \end{array}$$

$\therefore \sqrt{42\cdot 25}=6\cdot 5.$ *Ans.*

Ex. 2. Find the square root of ·00059049.

Sol.

$$\begin{array}{r|l} & \cdot 0\ \ \ 2\ \ \ 4\ \ \ 3 \\ \hline 2 & \overline{\cdot 00}\ \overline{05}\ \overline{90}\ \overline{49} \\ & \ \ \ \ \ \ 4 \\ \hline 44 & \ \ \ \ \ \ 190 \\ & \ \ \ \ \ \ 176 \\ \hline 483 & \ \ \ \ \ \ \ \ \ 1449 \\ & \ \ \ \ \ \ \ \ \ 1449 \\ \hline & \ \ \ \ \ \ \ \ \ \ \ \times \end{array}$$

Here the first period is ·00, so we place ·0 in the root.

$\therefore \sqrt{\cdot 00059049}=\cdot 0243.$ *Ans.*

Exercise 40

Find the square root of :

1. ·64. **2.** ·1024. **3.** ·1849. **4.** ·0729. **5.** ·0784

6. ·000225. **7.** ·000576. **8.** 4·4521. **9.** 127·69. **10.** 210·25.

11. 424·36. **12.** 1·0816. **13.** 147·1369. **14.** 9·0601. **15.** 216·09.

4. Square root to a certain number of decimal places.

Square root of 625 is 25 but the square root of ·625 is not exact. Similarly square root of 1·44 is 1·2 but the square root of 14·4 is not exact. So in case when square root is non-terminating, we find it to a certain number of decimal places.

Ex. 1. Find the square root of ·56423.

Sol.

```
      |  ·7  5  1
    7 | ·56 42 30
      |  49
  145 |   742
      |   725
 1501 |    1730
      |    1501
      |     229
```

Here we affix a 0 to make the number of decimal places even. When we have brought down the last period, we find that there is still a remainder. We may then annex pairs of zeros, and continue the process as long we please.

$\therefore \sqrt{\cdot 56423} = \cdot 751.$ *Ans.*

Note. If a decimal, in its simplest form, has an odd number **of places,** its square root cannot be found exactly.

Ex. 2. Find the square root of 14·4 to 3 decimal places.

Sol.

```
      |  3·  7  9  4
    3 | 14· 40 00 00
      |  9
   67 |  540
      |  469
  749 |   7100
      |   6741
 7584 |    35900
      |    30336
      |     5564
```

$\therefore \sqrt{14\cdot 4} = 3\cdot 794$ *Ans.*

Ex. 3. Find the square root of 3 to three decimal places.

Sol.

```
      | 1·  7  3  2
    1 | 3· 00 00 00
      | 1
   27 | 200
      | 189
  343 |  1100
      |  1029
 3462 |   7100
      |   6924
      |    176
```

$\therefore \sqrt{3} = 1\cdot 732$

From the above examples, we get the following

Rule. Add zeros (if required) to the right of the given number to make twice decimal places than required and then find the square root as in an ordinary case.

Exercise 41

Find the square root of the following to three decimal places :

1. ·1. 2. ·2. 3. 3. 4. ·4. 5. 6.
6. 7. 7. 183. 8. 987. 9. 40·42. 10. 54·123.

Find the value to four decimal places of the square root of :

11. 321 73025. 12. 3·1. 13. 9·6. 14. 5. 15. 9.

---

5. Square root of a Vulgar Fraction.

In finding the square root of a vulgar fraction, we find out the square root of the numerator and the denominator separately and then divide.

Ex. 1. Find the square root of :

(*i*) $\frac{4}{49}$ (*ii*) $1\frac{9}{16}$.

Sol. (*i*) $\sqrt{\frac{4}{49}}=\frac{\sqrt{4}}{\sqrt{49}}=\frac{2}{7}$ *Ans.*

(*ii*) $\sqrt{1\frac{9}{16}}=\sqrt{\frac{25}{16}}=\frac{\sqrt{25}}{\sqrt{16}}=\frac{5}{4}=1\frac{1}{4}$. *Ans.*

Ex. 2. Find the value of $\sqrt{\frac{36\cdot1}{102\cdot4}}$.

Sol. $\sqrt{\frac{36\cdot1}{102\cdot4}}=\sqrt{\frac{36\cdot1\times10}{102\cdot4\times10}}$

$=\sqrt{\frac{361}{1024}}=\frac{\sqrt{361}}{\sqrt{1024}}$

$=\frac{19}{32}$. *Ans.*

```
     1 9              3 2
  1 |3 61          3 |10 24
     1                9
 29 |261          62 |124
     261              124
      ×                ×
```

Exercise 42

Find the square root of :

1. $\frac{441}{484}$. 2. $\frac{625}{729}$. 3. $12\frac{1}{4}$. 4. $11\frac{1}{9}$,
5. $4\frac{25}{36}$. 6. $1\frac{23}{121}$. 7. $\frac{729}{1849}$. 8. $4\frac{29}{49}$.

Find the value of :

9. $\sqrt{\frac{25\cdot6}{52\cdot9}}$. 10. $\sqrt{\frac{\cdot1}{8\cdot1}}$.

The square root of the numerator or denominator or both are not always exact *e.g.*, $\sqrt{\frac{1}{2}}$, $\sqrt{\frac{11}{13}}$, etc. In such cases we apply the following rule :

Rule 1. In case when the square root of the numerator is not exact, but the square root of the denominator is exact, find the square root of the numerator to a certain number of decimal places (it is sufficient for us to take 3 decimal places) and then divide it by the square root of the denominator.

Rule 2. In case when the square root of the denominator is not exact (square root of the numerator may or may not be exact), multiply the numerator and the denominator by a number which makes the denominator a perfect square.

After that apply Rule 1.

OR

First divide the numerator by the denominator having twice the number of decimal places in the quotient than required in the square root. Then find the square root.

Ex. 1. Find the square root of $\frac{14}{9}$ to 3 decimal places.

Sol. $\sqrt{\frac{14}{9}}=\frac{\sqrt{14}}{\sqrt{9}}=\frac{3{\cdot}741}{3}$

$=1{\cdot}247.$

$\therefore$ the required sq. root

$=1{\cdot}247.$ *Ans.*

$$\begin{array}{r|l} & \cdot 3\ \ 7\ \ 4\ \ 1 \\ \hline 3 & 14\cdot 00\ 00\ 00 \\ & 9 \\ \hline 67 & 500 \\ & 469 \\ \hline 744 & 3100 \\ & 2976 \\ \hline 7481 & 12400 \\ & 7481 \\ \hline & 4919 \end{array}$$

Ex. 2. Find the square root of $\frac{15}{32}$ correct to three decimal places.

Sol. $\sqrt{\frac{15}{32}}=\sqrt{\frac{15\times 2}{32\times 2}}$

$=\frac{\sqrt{30}}{\sqrt{64}}=\frac{\sqrt{30}}{8}=\frac{5{\cdot}477}{8}$

$=0{\cdot}6846$

$\therefore\ \sqrt{\frac{15}{32}}=0{\cdot}685.$ *Ans.*

$$\begin{array}{r|l} & 5\cdot\ \ 4\ \ 7\ \ 7 \\ \hline 5 & 30\cdot\ 00\ 00\ 00 \\ & 25 \\ \hline 104 & 500 \\ & 416 \\ \hline 1087 & 8400 \\ & 7609 \\ \hline 10947 & 79100 \\ & 76629 \\ \hline & 2471 \end{array}$$

Ex. 3. Find the square root of (*i*) $\frac{1}{5}$. (*ii*) $2\frac{45}{59}$.

Sol. $\sqrt{\frac{1}{5}}=\sqrt{\frac{1\times 5}{5\times 5}}$

$=\frac{\sqrt{5}}{\sqrt{25}}=\frac{\sqrt{5}}{5}=\frac{2{\cdot}2360}{5}$

$=0{\cdot}4472$ nearly. *Ans.*

$$\begin{array}{r|l} & 2\cdot\ \ 2\ \ 3\ \ 6 \\ \hline 2 & 5\cdot\ 00\ 00\ 00 \\ & 4 \\ \hline 42 & 100 \\ & 84 \\ \hline 443 & 1600 \\ & 1329 \\ \hline 4466 & 27100 \\ & 26796 \\ \hline & 304 \end{array}$$

(*ii*)

$2\frac{45}{59}=2{\cdot}7627$

$\therefore\ \sqrt{2\frac{45}{59}}=\sqrt{2{\cdot}7627}$

$$\begin{array}{r|l}
 & 1{\cdot}\ 6\ 6 \\ \hline
1 & 2{\cdot}7627 \\
 & 1 \\ \hline
26 & 176 \\
 & 156 \\ \hline
326 & 2027 \\
 & 1956 \\ \hline
 & 71
\end{array}
\qquad\qquad
\begin{array}{r}
0{\cdot}7627 \\
59)\overline{45{\cdot}0000} \\
413 \\ \hline
370 \\
354 \\ \hline
160 \\
118 \\ \hline
420 \\
413 \\ \hline
7
\end{array}$$

$\therefore\quad \sqrt{2{\cdot}7627}=1{\cdot}66$ nearly.

Hence $\sqrt{2\frac{45}{59}}=1\ 66$ nearly. *Ans.*

Exercise 43

Find the square root of the following to 3 decimal places :

1. $\frac{3}{64}$. **2.** $\frac{3}{4}$. **3.** $\frac{8}{11}$. **4.** $\frac{2}{3}$. **5.** $\frac{1}{6}$.
6. $\frac{5}{13}$. **7.** $\frac{7}{17}$. **8.** $1\frac{11}{14}$. **9.** $1\frac{5}{48}$. **10.** $2\frac{2}{9}$.

---

6. Problems on Square Root

Ex. A school donated *Rs* 1056. 25 *P* in Jawaharlal Nehru Memorial Fund. Each student donated as many paise as there were students in the school. Find the number of students in that school.

Sol. *Rs* 1056. 25 *P*=105625 *P*.

Evidently the number of students is equal to the square root of 105625.

$\therefore$ No. of students$=\sqrt{105625}$

$=325.$ *Ans.*

$$\begin{array}{r|l}
 & 3\ 2\ 5 \\ \hline
3 & 105625 \\
 & 9 \\ \hline
62 & 156 \\
 & 124 \\ \hline
645 & 3225 \\
 & 3225 \\ \hline
 & \times
\end{array}$$

Exercise 44

1. Ram distributed 1225 bananas among his friends. He gave to each friend as many bananas as there were the friends ; find the number of his friends.

2. A society collected *Rs* 17. 64 *P*. Find the number of members of the society if each member contributed as many paise as there were members.

3. A man plants his orchard with 5625 trees, and arranges them so that there are as many rows as there are trees in a row ; how many rows are there ?

4. A man, after a tour finds that he had spent every day as many rupees as the number of days he had been on tour. He spent in all *Rs* 169. How long was he on tour ?

5. A shopkeeper purchases as many exercise-books as the price of one exercise-book is in paise. Find the price of one exercise-book if total amount spend be *Rs* 21. 16 *P*.

6. The students of VIII class collected *Rs* 20. Find the number of students in VIII class if each student gave as many 5 paise coins as there were the students.

7. Assuming that the area of a rectangle is length multiplied by breadth and that of a square, side squared ; find the length of a side of a square whose area is exactly equal to the area of a rectangle with sides 6 *m* 4 *dm* and 2 *m* 5 *dm*.

8. A gardener planted an orchard with 5776 trees. In each row there were as many trees as the number of rows. Find the number of rows.

9. Your class raised *Rs* 80 for Flood Relief Fund. Each student gave as many five paise coins as they were in number. Find the number of students.

10. A floor has 22801 tiles. There were as many tiles in one row as the number of rows. Find the number of rows.

8

Cube Root

1. Cube Root. If a number is the product of three equal factors, each such factor is called the **cube root** of that number.

Thus 7 is the cube root of 343, because $343 = 7 \times 7 \times 7$. Similarly ·5 is the cube root of ·125, because $\cdot 125 = \cdot 5 \times \cdot 5 \times \cdot 5$.

Remember that

2 is the cube root of 8   3 is the cube root of 27
4 is the cube root of 64   5 is the cube root of 125
6 is the cube root of 216   7 is the cube root of 343
8 is the cube root of 512   9 is the cube root of 729
10 is the cube root of 1000 and so on.

The symbol of cube root is $\sqrt[3]{\ }$.

Thus $\sqrt[3]{343} = 7$, $\sqrt[3]{\cdot 125} = \cdot 5$, $\sqrt[3]{\frac{343}{64}} = \frac{7}{4}$, $\sqrt[3]{\frac{1}{125}} = \frac{1}{5}$.

When the given number can be resolved into factors, we get its cube root by arranging the factors into 3 groups, so that each group consists of just the same factors. The product of the factors of each of those groups is the *cube root* required.

Ex. Find the cube root of 35937.

Sol.

$$35937 = 3 \times 3 \times 3 \times 11 \times 11 \times 11$$
$$= (3 \times 11)(3 \times 11)(3 \times 11)$$
$$\sqrt[3]{35937} = 3 \times 11$$
$$= 33. \quad \textit{Ans.}$$

$$\begin{array}{r|r} 3 & 35937 \\ \hline 3 & 11979 \\ \hline 3 & 3993 \\ \hline 11 & 1331 \\ \hline 11 & 121 \\ \hline 11 & 11 \\ \hline & 1 \end{array}$$

Exercise 45

Find the cube root of :

1. 216.
2. 729.
3. 1331.
4. 3375.
5. 9261.
6. 15625.
7. 19683.
8. 91125.
9. 157464.
10. 373248.

Ex. Resolve 1200 into its prime factors ; and hence find the smallest numbers by which it must be (*i*) multiplied, and (*ii*) divided to make it a perfect cube.

Sol. $1200=2\times2\times2\times2\times3\times5\times5$

$=(2\times2\times2)\times2\times3\times5\times5$

$=2^3\times2\times3\times5^2.$

$$\begin{array}{r|r} 2 & 1200 \\ \hline 2 & 600 \\ \hline 2 & 300 \\ \hline 2 & 150 \\ \hline 3 & 75 \\ \hline 5 & 25 \\ \hline 5 & 5 \\ \hline & 1 \end{array}$$

We know that if a number is a perfect cube then its every prime factor must occur three times.

(*i*) The number must be multiplied by $2^2\times3^2\times5$ *i.e.*, 180 to make it a perfect cube.

(*ii*) The number must be divided by $2\times3\times5^2$ *i.e.*, 150 to make it a perfect cube ?

Exercise 46

1. By what smallest number must 1125 be multiplied in order to make it a perfect cube ?

2. By what smallest number must 2058 be divided in order to make it a perfect cube ?

3. By what smallest number must 21600 be multiplied in order to make it a perfect cube ?

4. By what smallest number must 26244 be divided in order to make it a perfect cube ?

Ex. Find the cube root of $4\frac{149}{512}$.

Sol. $\sqrt{4\frac{149}{512}}=\sqrt[3]{\frac{2197}{512}}$

$=\frac{\sqrt[3]{2197}}{\sqrt[3]{512}}=\frac{\sqrt[3]{13\times13\times13}}{\sqrt[3]{8\times8\times8}}=\frac{13}{8}=1\frac{5}{8}.$ *Ans.*

$$\begin{array}{r|r} 13 & 2197 \\ \hline 13 & 169 \\ \hline 13 & 13 \\ \hline & 1 \end{array} \qquad \begin{array}{r|r} 2 & 512 \\ \hline 2 & 256 \\ \hline 2 & 128 \\ \hline 2 & 64 \\ \hline 2 & 32 \\ \hline 2 & 16 \\ \hline 2 & 8 \\ \hline 2 & 4 \\ \hline 2 & 2 \\ \hline & 1 \end{array}$$

Exercise 47

Find the cube root of :

1. $\frac{1}{216}$. 2. $\frac{27}{64}$. 3. $\frac{125}{512}$. 4. $\frac{1331}{2197}$. 5. $1\frac{169}{343}$.

MENTAL AGILITY TEST NO. 1

Time : 30 Minutes

Fill in the blanks :

1. 80 *g* =_*dag* 2. 15 *dag.* =_*g* 3. 900 *g* =....*hg*
4. 7 *hg* =_*g* 5. 480 *g* =_*dag* 6. 35 *dag* =_*g*
7. 3000 *g* =_*kg* 8. 5 *kg* =_*g* 9. 170 *hg* =_*kg*
10. 3 *kg* =_*dag* 11. 8 *kg* =_*g* 12. 5 *kg* =_*hg*
13. 7 *kg* =_*dag* 14. 9 *kg* =_*hg*
15. 12 *weeks*=_*months* 16. 2 *months* =_*days*
17. 2 *months* =_*weeks* 18. 24 *weeks* =_*months*
19. 4 *weeks* =_*days* 20. 3 *years* =....*months*
21. 28 *days* =_*weeks* 22. 1 *year* =_*days*
23. *Rs* 9·09 =_*paise* 24. 1234 *paise* =*Rs*_
25. 4·73 *m* =_*cm* 26. 4321 *m* =_*km* 27. 1·029 *kg* =_*g*
28. 1023 *mg*=....*g* 29. 7490 *ml* =_*l* 30. 987 *l* =_*kl*
31. $\frac{4}{7}+\frac{3}{8}$ =.... 32. $\frac{4}{7}-\frac{3}{7}$ =_ 33. $1-\frac{4}{7}$ =_
34. $1-\frac{3}{7}$ =_ 35. $\frac{1}{2}\times\frac{1}{3}$ =_
36. $\frac{1}{2}\times\frac{4}{8}$ =_ 37. ·1+·1+·1 =_ 38. ·1−·1 =_
39. ·1×·1 =_ 40. 1−·9 =_ 41. ·1+·2+·3=_
42. ·1×·2 =_ 43. ·1×·2×·3 =_ 44. ·1×·01 =_
45. 47·36×10=.... 46. 47 36×100 =_
47. 0·013×100 =_ 48. 0·013×1000=_ 49. 60·79÷100=_
50. 60·79÷1000=_ 51. $\sqrt{121}$ =_ 52. $\sqrt{01}$ =_
53. $\sqrt{\frac{4}{9}}$ =.... 54. $\sqrt{\frac{1\cdot6}{2\cdot5}}$ =_ 55. $\sqrt[3]{27}$ =_
56. $\sqrt[3]{\frac{1}{8}}$ =_ 57. $\sqrt{1}$ =_ 58. $\sqrt[3]{1}$ =_
59. L C.M. of 1, 2 and 3 =.... 60. H.C.F. of 1, 2 and 3 =_

OBJECTIVE TYPE QUESTIONS—SERIES I

1. Rewrite the following statements by selecting the correct word from the words given in brackets :

(*a*) CM is (twice/thrice) CCC. (*b*) XC is (thrice/twice) XXX.

(*c*) Six paise are written as (*Re* 0·60/*Re* 0·06).

(*d*) *Rs* 2·51, 5·7 metres are (simple/compound) quantities.

(*e*) A metre is (longer/shorter) than a yard.

(*f*) A centimetre is (longer/shorter) than an inch.

(*g*) A metre is a (multiple/submultiple) of a decimetre.

(*h*) A kilometre contains (100/1000) metres.

(*i*) A maund is (heavier/lighter) than 40 kilograms.

(*j*) A kilogram is (heavier/lighter) than a seer.

(*k*) A quintal is (more/less) than 3 maunds in weight.

(*l*) One metric tonne is equal to (100/1000) kilograms.

2. Fill in the blanks with suitable words. They are given below within brackets.

[two, three, five, six, seven, nine, ten, hundred, thousand]

(*a*) Hundreds of thousands consist of..........figures.

(*b*) Tens of crores consist of.......figures.

(*c*) One million is..........times one lac.

(*d*) DC is.....times CC. (*e*) CD is .....times LXXX.

(*f*) One quintal is equal to......kilograms.

3. Fill in the blanks with suitable words or figures :

(*a*) In 536, 500 is the ....value of 5.

(*b*) 999 is the.......number of three digits.

(*c*) 0 placed to the left of a number has..........value.

(*d*) XI when added to..........makes XX.

(*e*) In Roman notation 700 is written as..........

(*f*) 60 is the.....product of 3×4×5.

(*g*) The unit of capacity in the metric system is a.....

(*h*) The international metric unit of length is a.......

(*i*) The international metric unit of.......... is a gram.

(*j*) To find the H.C.F. of two or more concrete quantities reduce them to the.......

(*k*) The product of two numbers is equal to the ....of their H.C.F. and L.C.M.

(*l*) When the numerator and the denominator of a fraction have no common factor, the fraction is said to be in its ....

(*m*) To divide a decimal by 10, 100, 1000 move the decimal point by 1, 2, 3 places to the_____respectively.

(*n*) To multiply a decimal by 10, 100, 1000 move the decimal point by 1, 2, 3 places to the_____respectively.

4. Write the capital letter which stands by the correct answer in the Answer Box given on the Right Hand Side.

(*a*) The greatest number of four digits beginning with 3 and ending with 7 is

A. 3117. B. 3377. C. 3737. D. 3997. ☐

(*b*) The smallest number of four digits which begins with 5 and ends with 9 is

A. 9005. B. 9115. C. 5009. D. 5119. ☐

(*c*) The L.C.M. of two numbers which are prime to each other is their

A. sum. B. difference. C. product. D. division. ☐

(*d*) Square root of 0·16 is

A. 4. B. ·4. C. ·04. D. 0·04. ☐

5. Point out the mistakes, if any, in the following simplifications :

(*a*) $5\frac{1}{4} \div \frac{3}{7} \times \frac{1}{2} = \frac{21}{4} \div \frac{3}{14} = \frac{21}{4} \times \frac{14}{3} = \frac{49}{2} = 24\frac{1}{2}$.

(*b*) $5\frac{1}{4} \div \frac{3}{7}$ of $\frac{1}{2} = \frac{21}{4} \times \frac{7}{3} \times \frac{1}{2} = \frac{49}{8} = 6\frac{1}{8}$.

(*c*) $\frac{12}{5} \div \frac{3}{5}$ of $\frac{2}{5} + \frac{1}{2}$ of $\frac{3}{4} - \frac{107}{72} = \frac{12}{5} \times \frac{5}{3}$ of $\frac{2}{5} + \frac{3}{8} - \frac{107}{72}$.

(*d*) $\frac{12}{5} \div \frac{3}{5}$ of $\frac{2}{5} + \frac{1}{2}$ of $\frac{3}{4} - \frac{107}{72}$

$$= \frac{12}{5} \div \frac{3}{5} \text{ of } \frac{4+5}{10} \text{ of } \frac{3}{4} - \frac{107}{72}.$$

REVISIONAL EXERCISE–1

1. Add together the numbers 5367, 508, 1695, 80687 and 43105.

2. Subtract 7583 from 9457.

3. Find the value of 571–412+173–65–74+200.

4. Multiply 578 by 156 by factors.

5. Multiply 4793 by 486 by factors.

6. Divide 8704 by 536.

7. This is a 'magic square', *i.e.*, the total of each row, of each column and of each of the two diagonals is the same ; fill in the missing numbers.

17		1	8	15
23	5	7	14	
4		13		22
10	12			
11			2	9

8. Find the H.C.F. of 4059 and 2190.

9. Find the greatest number which is contained in 4641 and 7072 an exact number of times.

10. From three casks, 13, 45 and 72 litres of milk are respectively to be drawn. What is the capacity of the measure which will do this most quickly.

11. Find the L.C.M. of 8, 16, 24, 60, 120.

12. Find the smallest length of a rope which can be measured an exact number of times by three tapes measuring 2 *m*, 3 *m*, and 8 *m*.

13. Find the least amount of money that John should possess to enable him to buy a whole number of shirts valued at *Rs* 14, *Rs* 21 and *Rs* 28.

14. Find the least number which when divided by 8, 12 and 16 leaves 3 as remainder in each case.

15. Ravi paid *Rs* 152·60, *Rs* 283·02, *Rs* 594·13 and *Rs* 200·25 to four shopkeepers. What sum of money did he pay in all ?

16. How much is *Rs* 1000 greater than the sum of *Rs* 507·81, *Rs* 211·32 *Rs* 100·03 ?

17. How many knives worth 50 *P* each should be given in exchange for 375 pencils worth 6 *P* each ?

18. I sold 15 cameras at *Rs* 135·38 *P* each. With this amount I purchased 5 cycles. Find the cost of each cycle.

19. How many tables worth *Rs* 140·50 each should be given in exchange for 180 chairs worth *Rs* 14. 5 *P* each ?

20. A certain parcel weighs 5437896 centigrams. Find its weight (*a*) in dekagrams, (*b*) in kilograms, (*c*) in *kg*, *hg*, *dag*, *etc*.

21. Add 8 *kg* 6 *hg* 9 *dag* 7 *g*, 11 *kg* 6 *hg* 8 *dag* 6 *g* and 7 *kg* 6 *hg* 2 *dag* 8 *g*.

22. Divide 51 *kg* 1 *hg* 5 *dag* 6 *g* by 12.

23. Add together : 13 *m*, 7 *dm* 7 *cm*, 26 *m* 3 *dm* 3 *cm*, 3 *m* 9 *dm* 1 *cm*, 57 *m* 9 *dm* 4 *cm*.

24. A road 5 *km* 2 *hm* 4 *dam* long was to be repaired by a gang of workmen who repaired 258 *m* a day for 8 days. How many kilometres remained to be repaired ?

25. Reduce $\frac{5}{6}$, $\frac{7}{8}$ and $\frac{11}{12}$ to the fractions having the least common denominator.

26. Reduce $\frac{612}{618}$ to its lowest terms.

27. Which is greater : $\frac{5}{6}$ or $\frac{4}{3}$? **28.** Which is smaller : $\frac{7}{8}$ or $\frac{3}{4}$?

29. Arrange $\frac{2}{3}$, $\frac{5}{6}$, $\frac{3}{4}$ in descending order of magnitude.

30. Add together : $1\frac{4}{12}$, $2\frac{5}{6}$, $\frac{3}{9}$, $3\frac{7}{8}$. **31.** Subtract $15\frac{7}{8}$ from $20\frac{5}{9}$.

32. Find the value of $1\frac{3}{4}+2\frac{5}{6}-3\frac{1}{2}-\frac{5}{12}$.

33: Add together 3·02, 0·7, 14·258 and 13·5.

34. What should be added to 25·746 to make 34·5 ?

35. One fisherman caught three fish weighing 6·87 *kg*, 5 36 *kg*, and 3·24 *kg*. Another fisherman caught two fish weighing 8·78 *kg* and 5·68 *kg*. Which of the two fishermen, had the bigger catch and by how much ?

36. Express 8·4 min. as minutes and seconds.

37. Multiply ·0051 by ·39. **38.** Divide 6·5 by 0·0005.

39. Find the value of $\frac{7}{39}$ of *Rs* 487. 50 *P*.

40. Reduce *Rs* 6. 30 *P* to the fraction of *Rs* 14. 70 *P*.

41. Simplify : $1\frac{5}{6}+5\frac{1}{3}$ of $3\frac{3}{4}\div2\frac{1}{19}\times\frac{7}{10}$.

42. Extract the square root of 327184.

43. Find the square root of 2582449.

44. Extract the square root of 20·8849.

45. Find the square root of $\frac{2}{9}$.

46. Find the square root of $\frac{3}{7}$ to three places of decimals.

47. Find the cube root of 21952.

48. Find the cube root of $\frac{3475}{10648}$.

9

Percentage

1. The term **per cent** (*Pratishat*) means for every hundred.

Def. A fraction whose denominator is 100 is called a **percentage** and the numerator of the fraction is called the **rate per cent.**

Thus '7 p c.' and $\frac{7}{100}$ mean the same thing, *i.e.*, '7 parts out of every 100 parts'.

The term per cent is sometimes shortened as p.c. The symbol '%' is often used for per cent. Thus, 5% or 5 p.c. means 5 per cent.

Ex. 1. What fraction is equivalent to $37\frac{1}{2}$ per cent ?

Sol. $37\frac{1}{2}$ p.c. $=\frac{37\frac{1}{2}}{100}=\frac{\overset{3}{\cancel{75}}}{2\times\underset{4}{\cancel{100}}}=\frac{3}{8}$. *Ans.*

Ex. 2. Express $\frac{1}{4}$ as rate per cent.

Sol. $\frac{1}{4}=\frac{\frac{1}{4}\times 100}{100}=\frac{25}{100}=25\%$. *Ans.*

Ex. 3. Find 8 per cent of *Rs* 625.

Sol. 8 per cent $=\frac{8}{100}$.

∴ 8 per cent of *Rs* 625 $=\frac{8}{100}$ of *Rs* 625

$=$ *Rs* $\frac{\overset{2}{\cancel{8}}}{\underset{4}{\cancel{100}}}\times\overset{25}{\cancel{625}}=$ *Rs* 50. *Ans.*

Exercise 48

1. Express as fractions the following :

(*i*) 10%. (*ii*) 40%. (*iii*) $12\frac{1}{2}\%$. (*iv*) $33\frac{1}{3}\%$. (*v*) $8\frac{1}{3}\%$.

2. Give percentages equivalent to the following fractions :

(*i*) $\frac{1}{4}$. (*ii*) $\frac{1}{8}$. (*iii*) $\frac{1}{6}$. (*iv*) $\frac{1}{13}$. (*v*) ·21. (*vi*) ·439.

Find the value of :

3. 5 p c. of *Rs* 1400.
4. 6 p.c. of *Rs* 7150.
5. 4 p.c. of 37 *kg* 500 *g*.
6. $66\frac{2}{3}$ p.c. of 2 *kg* 6 *hg* 3 *dag* 7 *g*.

Ex. 1. A person saves $12\frac{1}{2}\%$ of this monthly salary. If he earns *Rs* 720, how much does he save every month ?

Sol. Out of *Rs* 100, he saves $=$ *Rs* $\frac{25}{2}$.

∴ Out of *Re* 1, he saves $=$ *Rs* $\frac{25}{2}\times\frac{1}{100}$.

∴ Out of *Rs* 720, he saves $=$ *Rs* $\frac{25}{2}\times\frac{720}{100}=$ *Rs* 90. *Ans.*

Ex 2. A boy gets 65% marks in an examination. If he gets 520 marks, find the total number of marks.

Sol. When he gets 65 marks, the total marks $=100$.

∴ When he gets 1 mark, the total marks $=\frac{100}{65}$.

∴ When he gets 520 marks, the total marks $=\dfrac{100\times520}{65}=800$. *Ans.*

Exercise 49

1. A rent collector gets $1\frac{1}{2}$ p.c. for collecting rent. What will he receive for collecting *Rs* 5000 ?

2. An agent sells goods worth *Rs* 2764 ; what is his commission at $12\frac{1}{2}$ p.c. ?

3. What is the commission at $6\frac{1}{4}$ p.c. on a sale of goods for *Rs* 1620 ?

4. A cask containing 425 litres lost 8 p.c. by leakage ? How many litres were left in the cask ?

5. How much remains out of *Rs* 3000 after $7\frac{3}{4}$ p.c. of it has been spent ?

6. What is the number, $12\frac{1}{2}$ p.c. of which is 64 ?

7. What is the sum of money of which $3\frac{3}{4}$ p.c. is *Rs* 45 ?

8. 17 p.c. of a certain number of mangoes go bad ; find the number of mangoes if 1360 go bad.

9. $6\frac{1}{4}$ p.c. of a certain sum of money is *Rs* 10·30. Find the sum.

10. After spending 69 p.c. of her money, a lady has *Rs* 93 left. How much had she at first ?

11. Neeta totalled her marks and obtained 155. Actually she made some mistake while adding because she got 175 marks. Find the percentage error.

12. Of a man's salary 20% is paid as rent, 55% are his living expenses, 15% is deposited in the post office. If he spends the remaining *Rs* 30 on the education of his children, find his salary.

13. A woman has a certain number of mangoes of which 13% are bad She gives 75% of the remainder in charity and then has 261 left. How many had she at first ?

14. An electrical contractor purchases a certain amount of wire, 10% of which is stolen. After using 85% of the remainder, he had $47\frac{1}{4}$ metres of wire left. How much wire did he purchase ?

15. During one year the population of a village increased by 5% and during the next year it diminished by 5%. If at the end of the second year the population was 798, what was it at the beginning of the first year ?

□

10

Profit and Loss

1. If a man buys a watch for *Rs* 125 and sells it for *Rs* 135, he makes a profit of *Rs* 10. Here *Rs* 125 is the cost price (C.P.), *Rs* 135 is the selling price (S.P.) and *Rs* 10 is the profit or gain.

Thus Profit=Selling Price−Cost Price.

Now suppose a man buys a watch for *Rs* 225 and sells it for *Rs* 205, he loses *Rs* 20.

Thus Loss=Cost Price−Selling Price

The profit or loss is always calculated on the cost price. It is expressed as a percentage of cost price.

2. To find gain or loss per cent.

Ex. 1. A man purchased a radio for *Rs* 500 and sold it gaining *Rs* 25. Find his gain per cent.

Sol. Here C.P.=*Rs* 500. Gain=*Rs* 25.

On *Rs* 500, his gain=*Rs* 25

$$\therefore \text{ ,, } Re\ 1 \text{ ,, ,, } = Re\ \frac{25}{500}$$

$$\therefore \text{ ,, } Rs\ 100 \text{ ,, ,, } = Rs\ \frac{25\times100}{500} = Rs\ 5.$$ 5% is the gain. *Ans.*

Ex. 2. A man buys a chair for *Rs* 25 and sells it for *Rs* 20. Find his loss per cent.

Sol. Cost price=*Rs* 25. Selling price=*Rs* 20.

∴ Loss=*Rs* (25−20)=*Rs* 5.

Loss on *Rs* 25=*Rs* 5.

$$\therefore \text{ ,, ,, } Re\ 1 = Rs\ \frac{5}{25}$$

$$\therefore \text{ ,, ,, } Rs\ 100 = Rs\ \frac{5\times100}{25} = Rs\ 20.$$ ∴ 20% is the loss *Ans.*

Exercise 50

1. Ramu purchased a bicycle for *Rs* 237 and sold it for *Rs* 273. Find his gain or loss.

2. Nita purchased a saree for *Rs* 200 and sold it for *Rs* 189·75. Find her gain or loss.

3. I purchased a chair for *Rs* 35 and sold it for *Rs* 42. Find my gain per cent.

4 Ram bought a radio for *Rs* 450 and sold it for *Rs* 400. Find his loss per cent.

5. Atta is bought at *Re* 1. 30 *P* a *kg* and sold at *Re* 1. 50 *P* a *kg*. Find the gain per cent.

6. A quintal of tea is bought for *Rs* 1040 and retailed at *Rs* 11. 10 *P* a *kg*. What is the gain per cent ?

7. A merchant buys 50 litres of wine for *Rs* 625 and sells it at *Rs* 12 a litre. What is his loss per cent ?

8. A lady bought a watch for *Rs* 80 and sold it for *Rs* 100 Find her gain per cent.

9. What will be the gain % if eggs are bought at 6 for *Rs* 2·10 and sold at 5 for *Rs* 2·00 ?

10 A lady bought a cow for *Rs* 600 and spent *Rs* 50 on fodder. Now she sells it for *Rs* 620 ; find her gain or loss per cent.

3. To find selling price.

Ex. A man bought a tape recorder for *Rs* 600. For how much should he sell it so as to gain 10% ?

Sol. Let C.P.=*Rs* 100. Then Gain=*Rs* 10.

∴ S.P.=*Rs* 100+*Rs* 10=*Rs* 110

If the C.P. is *Rs* 100, the S.P.=*Rs* 110

∴ ,, ,, *Re* 1 ,, ,, $= Rs\ \frac{110}{100}$

∴ ,, ,, *Rs* 600 ,, ,, $= Rs\ \frac{110 \times 600}{100} = Rs\ 660.$ *Ans.*

Exercise 51

1. Mohan bought a pen for *Rs* 10 and sold it at a gain of 5%. Find the selling price of the pen.

2. Hamid purchased a table for *Rs* 59 and sold it at a loss of 25%. Find its selling price.

3. For what sum must I sell a book which costs me *Rs* 2·40 so as to gain $12\frac{1}{2}$% ?

4. For what sum must I sell goods which cost me *Rs* 37·60 so as to gain $7\frac{1}{2}$% ?

5. A quintal of sugar is bought for *Rs* 370. At what price per *kg* must it be retailed so as to make a profit of 10% ?

4. To find the cost price.

Ex. By selling a radio for *Rs* 352·88. Harnam Singh lost 12%, find the cost price.

Sol. Let C.P.=*Rs* 100. Then loss=*Rs* 12.

∴ S.P.=*Rs* 100−*Rs* 12=*Rs* 88.

If the S.P. is *Rs* 88, the C.P.=*Rs* 100

∴ „ „ *Re* 1, „ „ $= Rs\ \frac{100}{88}$

∴ „ „ *Rs* 352 88 „ $= Rs\ \frac{100 \times 352{\cdot}88}{88} = Rs\ 401.$ *Ans.*

Exercise 52

1. Sohan sold a transistor for *Rs* 234 and thus gained 17%. Find the cost price of the radio.

2. A man sells a sofa for *Rs* 434 making a profit of 8½%. What did the sofa cost him ?

3. If 11% be lost on a book sold for *Rs* 2·67, what was the cost price of the book ?

4. I buy goods which I sell for *Rs* 233 91 making a profit of 13%. Find the buying price.

5. If by selling a tricycle for *Rs* 187·47 a shopkeeper gains 12½%, find his cost.

□

11

Simple Interest, Savings and Post Office

1. In our daily life whenever we hire a tonga or a taxi to go from one place to another, we pay fare for it, just as we pay rent for using other's house. Similarly, if we take a loan from a bank or a money-lender, he would like to charge us a fee for it. This fee is called **interest** (*Vyaj*).

The sum lent is called the **principal** (*Mooldhan*). Interest is usually calculated at the rate of so many rupees for every *Rs* 100 of the money lent for a year. This is called the **rate per cent per annum** (*Pratishat varshik dar*).

'Per annum' means for a year. Sometimes the words 'per annum' are omitted. Thus 6% means that *Rs* 6 is the interest on *Rs* 100 for a year.

The sum of the principal and interest is called the amount (*Mishradhan*).

The interest is usually paid **yearly** (*Varshik*), **half-yearly** (*Chhai-masik*) or **quarterly** (*Trai-masik*) as agreed upon.

Interest is of two kinds, **simple** and **compound.** When the interest is calculated on the original principal for any length of time it is called *simple interest*. The word '*simple*' is generally omitted and we simply write '*interest*' for 'simple interest'.

2. There are two methods of calculating simple interest.

(*i*) The Unitary Method. (*ii*) The Formula Method.

Ex. 1. Find the interest on *Rs* 400 for 5 years at 6 per cent per annum.

Sol. The Unitary Method.

Interest on *Rs* 100 for 1 year $= Rs\ 6$

∴ Interest on *Re* 1 for 1 year $= Rs\ \frac{6}{100}$.

∴ Interest on *Rs* 400 for 1 year $= Rs\ \frac{400 \times 6}{100}$

∴ Interest on *Rs* 400 for 5 years $= Rs\ \frac{400 \times 6 \times 5}{100} = Rs\ 120$. *Ans.*

By the formula method, the above question can be solved as under :

Principal $(p) = Rs\ 400$, Time $(n) = 5$ years, Rate $(r) = 6\%$

$$I = \frac{p \times n \times r}{100}$$

∴ Required interest $= Rs\ \frac{400 \times 5 \times 6}{100} = Rs\ 120$. *Ans.*

Ex. 2. Find the simple interest and amount of *Rs* 1500 for $1\frac{1}{2}$ years at 4% half-yearly.

Sol. Because the interest here is calculated half-yearly, so we convert the time into half-years.

Here principal (p) = *Rs* 1500, Time $(n) = 1\frac{1}{2}$ years = 3 half-years.

Rate $(r) = 4\%$ half-yearly. $I = \frac{p \times n \times r}{100}$

$\therefore$ Interest = *Rs* $\frac{1500 \times 3 \times 4}{100}$ = *Rs* 180. *Ans.*

Amount = Principal + Interest

$\therefore$ Amount = *Rs* 1500 + *Rs* 180 = *Rs* 1680. *Ans.*

Exercise 53

Find the simple interest and amount of :

1. *Rs* 30 for 3 months at 3 *P* per rupee per month.
2. *Rs* 50 for 6 months at 6 *P* per rupee per month.
3. *Rs* 75 for 2 months at 2 *P* per rupee per month.

Find the simple interest on :

4. *Rs* 7000 for $4\frac{1}{4}$ years at 4 p.c.
5. *Rs* 385 for 6 years at $2\frac{1}{2}$ p.c.
6. *Rs* 925 50 *P* for 4 years at $3\frac{1}{2}$ p.c.

Find the amount of :

7. *Rs* 1680 for 14 months at $2\frac{1}{2}$ p.c.
8. *Rs* 2160 for 1 year 8 months at $12\frac{1}{2}$ p.c.
9. *Rs* 2000 for 2 years 2 months at 6 p.c.

Find the simple interest on :

10. *Rs* 1050 for 2 years at $2\frac{1}{2}$ p.c. half-yearly.
11. *Rs* 420. 50 *P* for 1 year at 3 p.c half-yearly.
12. *Rs* 1000 for 7 months at 6 p.c. half-yearly.

Find the simple interest on :

13. *Rs* 1200 for $\frac{3}{4}$ year at 1 p.c. quarterly.
14. *Rs* 760 for 6 months at $1\frac{3}{4}$ p.c. quarterly.
15. *Rs* 850 for 1 year at 2 p.c. quarterly.
16. A person puts out *Rs* 2500 to interest at $4\frac{1}{4}$ p c. What annual income does he derive from it.

---

3. Interest for a number of days.

In counting the number of days *between two given dates*, the first day on which money is lent, is not included for calculating the interest.

Ex. 1. Find the simple interest on *Rs* 306 from 3rd March, 1970 to 27th July, 1970 at $3\frac{3}{4}\%$ per annum.

Sol. Principal = *Rs* 306, Time = 146 days or $\frac{146}{365}$ year, Rate = $\frac{15}{4}\%$

$$I=\frac{p\times n\times r}{100}$$

$$\therefore \quad \text{Interest}=\frac{\overset{153}{\cancel{306}}\times\overset{2}{\cancel{146}}\times\overset{3}{\cancel{15}}}{100\times\underset{5}{\cancel{365}}\times\underset{2}{\cancel{4}}}$$

$$=Rs\ \frac{459}{100}=Rs\ 4{\cdot}59. \quad \textit{Ans.}$$

How to calculate time ?

March = 31 − 3 = 28 days
April = 30 days
May = 31 ,,
June = 30 ,,
July = 27 ,,
Total 146 days

Note. 73, 146, 219 and 292 days are respectively $\frac{1}{5}$, $\frac{2}{5}$, $\frac{3}{5}$ and $\frac{4}{5}$ of a year.

Exercise 54

Find the interest on :

1. *Rs* 550 from 16th March, 1970 to 28th May, 1970 at 5 p.c.
2. *Rs* 2000 from April 28, 1969 to September 21, 1969 at 6 p.c.
3. *Rs* 500 from 11th October, 1961 to 18th May, 1962 at $3\frac{3}{4}$ p.c.
4. *Rs* 125 from 1st January, 1964 to 19th October, 1964 at $6\frac{1}{4}$ p.c.
5. Vimla placed *Rs* 5000 in fixed deposits in the Punjab National Bank on 3rd June and took it back on the 27th October of the same year. If the rate of interest was 4 p.c., how much did she get ?

---

4. Savings and Post Office

Every householder should try to save something from his monthly income. What we save after meeting the necessary expenses out of our income is called our **Saving.**

Saving is essential because the financial position of a person may not always remain the same. Sometimes there is a loss in business and sometimes illness intervenes Old age death, etc., may also cut off our income. Hence saving is very essential. These savings are of great use when evil befalls a person.

The savings may be invested in Government Securities and Treasury Bills. It is a very safe investment. Some people buy immovable property or shares of companies. They may invest money on a mortgage also. But the most common way of keeping the savings safe for a man of average means is to deposit his savings in a Bank as Fixed Deposits or Saving Funds.

5. The **post office** also offers a big scope for savings. We can buy *National Saving Certificates* for 5, 7 or 12 years. These certificates are in the denominators of *Rs* 5, 10, 50, 100, 500, 1000 and 5000. These can be transferred

to another person also. For small savings National Savings Stamps are available from the post offices. You can buy National Savings Stamps worth 25 *P*, 50 *P* and *Re* 1. Afterwards you can combine these stamps and get in exchange National Savings Certificates of any denomination you want. The post office gives interest on these savings certificates.

Then there are *Ten-Year Treasury Savings Deposits.* We can buy Ten-Year Treasury Savings Deposits up to *Rs* 25,000. The government pays interest on these deposits every year. National Defence Certificates are also issued by Post Offices.

Then we had sometimes back Five-Year Interest Free Prize-Bonds, and Five-Year Premium Prize-Bonds.

Post Office Savings Bank is very convenient for a man of ordinary means. He can deposit his small savings in the local post office. Whenever he stands in need of money he can withdraw the needed amount from the post office. The post office allows interest on the amount that stands to the credit of the depositor. The savings remain safe also from thieves.

There are fixed rules about withdrawal and deposit and these can be ascertained from the post office.

Exercise 55

1. Dharam Pal bought five National Defence Certificates of the value of *Rs* 100 each. He will encash them after 12 years.

How much will he get ? [A certificate of *Rs* 100 would fetch *Rs* 175 on maturity.]

2. Hari Ram bought three National Defence Certificates of the value of *Rs* 100 each. He encashed them after six years. The surrender value of a 100-rupee certificate after 6 years is *Rs* 126. How much did he get ?

3. Suresh deposited *Rs* 5000 with the Punjab National Bank in the fixed deposit for six months. Calculate the amount if the rate of interest is $3\frac{3}{4}\%$ per annum.

4. Raju deposited *Rs* 1500 in the Savings Bank account with the General Post Office, New Delhi on 1st January, 1960. If the rate of interest was $4\frac{1}{2}$ p.c how much interest did he get on 1st March, 1960 ?

□

12

Compound Interest

1. Money is said to be lent at **Compound Interest (C.I.)** when at the end of a year or other fixed period the interest that has become due is not paid to the lender but is added to the sum lent, and the amount thus obtained becomes the principal for the next period. The process is repeated until the amount for the last period has been found. The difference between the original principal and the final amount is the required compound interest.

Ex. 1. Find the amount and compound interest on *Rs* 4000 for 3 years at 5 p.c. per annum.

Sol.

Principal for the 1st year = *Rs* 4000.

Interest ,, ,, ,, ,, $= Rs\ \frac{4000 \times 5 \times 1}{100} = Rs\ 200.$

∴ Principal for the 2nd year = *Rs* 4200.

Interest ,, ,, ,, ,, $= Rs\ \frac{4200 \times 5 \times 1}{220} = Rs\ 210.$

∴ Principal for the 3rd year = *Rs* 4410.

Interest ,, ,, ,, ,, $= Rs\ \frac{4410 \times 5 \times 1}{100} = Rs\ 220{\cdot}50.$

∴ Amount at the end of 3 years = *Rs* 4630 50.

Compound Interest

= Amount − Original Principal = *Rs* 4630·50 − *Rs* 4000 = *Rs* 630·50.

∴ the required C.I. = *Rs* 630·50. *Ans.*

To obtain each year's interest we multiply each year's principal by the rate per cent *i.e.*, 5 and divide by 100. The division by 100 is done by writing the product two places to the right.

Note. 1. The compound interest for 3 years may also be found by adding together the first year's interest, the second year's interest and the third year's interest.

Note 2. If in the above example interest for 2¼ years was required, it would be found by adding the compound interest for the first two years and ¼ of the interest for the third year.

Interest for 2¼ years = *Rs* 200 + *Rs* 210 + ¼ of *Rs* 220·50.

= *Rs* 200 + *Rs* 210 + *Rs* 55. 12½ *P.* = *Rs* 465. 12½ *P. i.e.*, *Rs* 465·13.

Exercise 56

Find the amount at compound interest of :

1. *Rs* 625 in 2 years at 4 p.c.
2. *Rs* 450 in 2 years at 5 p.c.

Find the compound interest on :

3. *Rs* 1000 for 2 years at 5 p.c.
4. *Rs* 5000 for 2 years at 4 p.c.
5. *Rs* 10000 for 2 years at 3 p.c.
6. *Rs* 4000 for 3 years at 10 p.c.
7. *Rs* 4000 for 2½ years at 10 p.c.
8. *Rs* 3000 for 1½ years at 5 p.c.

---

2. When the rate p.c. is not an integer, the following method may be used with advantage.

Ex. 2. Find the compound interest on *Rs* 1600 for 3 years at 3¾ p.c. per annum.

Sol. Here 3¾ p.c.=2½ p.c.+1¼ p.c.
=2½ p.c.+½ of 2½ p.c.

	Rs		
	1600		
2½ p.c.=$\frac{1}{40}$	40	the interest at 2½ p.c.	Interest for 1st year
1¼ p.c.=$\frac{1}{80}$	20	,, ,, ,, 1¼ p.c.	
	1660	the principal for 2nd year.	
2½ p.c.=$\frac{1}{40}$	41·50	the interest at 2½ p.c.	Interest for 2nd year
1¼ p.c.=$\frac{1}{80}$	20·75	,, ,, ,, 1¼ p.c.	
	1722·25	the principal for 3rd year.	
2½ p.c.=$\frac{1}{40}$	43·05625	the interest at 2½ p.c.	Interest for 3rd year
1¼ p.c.=$\frac{1}{80}$	21·52812	,, ,, ,, 1¼ p.c.	
	1786·83437	=amount in 3 years.	
	1600	=pricipal	
	186·83437	=total interest.	

∴ C.I.=*Rs* 187. 83 *P*. *Ans.*

Note. The aliquot parts of the following rates may be remembered.

4¾ p.c.=2⅓ p.c.+1¼ p.c.+1 p.c.
2¾ p.c.=2½ p.c.+¼ p.c.
1¾ p.c.=1¼ p.c.+½ p.c.
3½ p.c.=2½ p.c.+1 p.c.

3. **Interest payable half-yearly.** In this case the interest is to be calculated for each half-year at half the given rate p.c. Since there are 2 half-years in a year, we may say that the process of finding the compound interest for 2 years at 7 p.c. payable half-yearly is the same as finding the compound interest for 4 years at 3½ p c.

Interest payable quarterly. Since there are 4 quarters in a year, the process of finding the compound interest for 1¼ years at 8 p.c. payable quarterly is the same as finding the compound interest for 6 years at 2 p.c.

Exercise 57

Find the compound interest on :

1. *Rs* 1600 for 2 years at $2\frac{1}{2}$ p.c. **2.** *Rs* 2700 in 3 years at $3\frac{1}{3}$ p.c.

3. Find the amount of *Rs* 1000 in 1 year at 5 p.c. compound interest payable half-yearly.

4. Find the compound interest on *Rs* 6400 in 1 year 6 months at 5% interest being calculated half-yearly.

5. Find the compound interest on *Rs* 10,000 in 9 months at 4% interest payable quarterly.

6. Find the compound interest payable half-yearly on *Rs* 800 for 2 years at 4 per cent.

Inverse Questions on Compound Interest

4. To Find Principal.

Ex. 1. What principal will amount to *Rs* 1352 in 2 years at 5 p.c. compound interest ?

Sol. Let the principal be *Rs* 100.

	Rs
1st principal	100·00
1st year's int.	4·00
2nd principal	104.00
2nd year's int.	4·16
Amount	108·16

If amount is *Rs* 108·16, **principal=*Rs* 100.**

∴ ,, ,, is *Re* 1, principal=*Rs* $\frac{100}{108\cdot16}$

∴ ,, ,, is *Rs* 1352, principal=*Rs* $\frac{100\times1352}{108\cdot16}$=*Rs* 1250. *Ans.*

Exercise 58

1. What sum of money will amount to *Rs* 676 in 2 years at 4 p.c. compound interest ?

2. What sum will amount to *Rs* 39. 69 *P* in 2 years at 5 per cent per annum compound interest ?

3. What principal will amount to *Rs* 4630·50 in 3 years at 5% compound interest ?

4. On what principal will the compound interest for 3 years at 5% amount to *Rs* 63·05 ?

5. What sum of money lent at compound interest will amount to *Rs* 15746·40 in 3 years at 8 per cent ?

6. On what sum will the compound interest for $2\frac{1}{2}$ years at 10% amount to *Rs* 1325. 50 *P* ?

□

13

Cash Memo and Bills. Income and Expenditure Accounts. Family Budgets

If you go to a shop and buy goods, the seller of the goods will give you a **cash-memo** or **bill** in which are set down the various articles bought, the cost of each and the total amount. Below the total, sales tax is added to the cost. If you pay for the goods at that time, a **cash-memo** is given. If you do not make immediate payment *i.e.*, you buy goods on credit, you will be issued a **bill**. Then you are asked to sign the duplicate of the bill. When you make the payment, a receipt is issued to you by the shopkeeper.

If a person at Delhi orders for some goods from a dealer at Bombay, the dealer will send him an **invoice**. The invoice is almost identical to a bill except that it may contain the mode of transport by which the parcel is sent and the name of bank, etc., through which the goods receipt is presented. Sometimes if you want to make payment of a bill, the bill is **receipted**, *i.e.*, the seller writes the word 'received' on it.

If the amount of the bill exceeds *Rs* 20, a 20 paise revenue stamp must be affixed by the receiver of the payment and his signatures put over the stamp. However, no revenue stamp is needed in a cash-memo, whatever may be its amount.

Each separate amount in a bill or cash-memo is called an **item**.

Specimen of a Cash Memo

Cash Memo

PITAMBAR BOOK DEPOT

Publishers and Booksellers

888, East Park Road, New Delhi-110005.

No. 1169

1st March, 79

Ram Chand & Sons, Karol Bagh, New Delhi

No. of copies	*Name of Book*	*Price per copy*	*Amount*	
		Rs	*Rs*	*P*
32	Demonstrative Geometry	1/50	48	00
20	Middle Standard Geometry	3/-	60	00
5	Sage of Shantiniketan	2/50	12	50
	Total		120	50

E. & O. E.

for Pitambar Book Depot
Shiv Shankar
Manager

A bill will be similar to the above given cash-memos. In place of the words 'Cash-memo' on the top, the word 'Bill' will be written.

Exercise 59

Prepare cash-memo for the following purchases and find the amount payable in each case :

1. 10 metres silk at *Rs* 5·75 per metre.
   7 metres long cloth at *Rs* 2·25 per metre.
   6 metres muslin at *Rs* 3 per metre.
   10 hankies at *Rs* 1·15 each.   6 underwears at 75 paise each.
2. 10 *kg* gur at *Rs* 1·82 per *kg*.   15 *kg* tea at *Rs* 10·50 per *kg*.
   6 *kg* sugar at *Rs* 3·55 per *kg*.   3 *kg* coffee at *Rs* 12·25 per *kg*.
3. 4 copies of New Method Arithmetic at *Rs* 3 each.
   8 copies of New Style Geometry at *Rs* 2·50 each.
   6 copies of New Scheme Algebra at *Rs* 2 each.
   6 copies of The World We Live In at *Rs* 2·50 each.
4. $36\frac{1}{2}$ *m* of velvet at *Rs* 5·60 per *m*.
   $30\frac{1}{2}$ *m* of flannel at *Rs* 6·80 per *m*.
   $40\frac{3}{4}$ *m* of linen at *Rs* 3·20 per *m*.
   $3\frac{1}{2}$ gross reels of cotton thread at 90 *P* per dozen reels.
   Deduct 5% discount on the total amount.

Keeping Accounts. Income and Expenditure Account

It is important for every business man to keep a record of his transactions. No person can trust his memory too long. He forgets to whom he owes something and from whom he is to receive something, unless he keeps a written record of all dealings. Similarly we should keep records of various societies, clubs, unions, etc. It is better for an individual too, keep a record of his income and expenditure. The accounts are kept is specially prepared books. The exact books of accounts to be maintained depend on the needs of the person. But there are some books which every society or firm need to maintain.

Suppose the students of a school form a cooperative society for the purposes of purchasing and selling books and stationary to the students. Satish is the manager of the book-stall. He will have to maintain the following books of accounts regarding the book-stall.

1. **Cash Book.**
2. **Ledger.**
3. **Stock Book.**

1. Cash Book. In this book, Satish will enter the dealings regarding every cash transaction. There are two sides of the page of a Cash Book. Whenever we receive any money, it is entered on the left hand side. Whenever some money is paid, it is written on the right hand side. The excess of receipts over payment represent the crsh balance with us and should be frequently checked.

Specimen of Cash Book

1978 1 Jan.	To Amount received from Principal as grant.	500-00	1978 5 Jan	By purchase of Books.	228·50
18 Jan.	To amount received on sale of books.	112-50	9 Jan.	By purchase of stationery	95-00
25 Jan.	To amount received on sale of stationery.	105-00	31 Jan.	By balance carried over	394-00
		717-50			717-50
1 Feb.	To balance brought over	394-00			

2. Ledger. In this book, Satish will keep the accounts of persons of firms with which the store had some transaction. If the store purchases some books on credit he will open an account of that firm in his ledger. He will enter the total amount of the books bought on the right hand side and when the payment is made, it would be entered on the left hand side. The balance, if any, will represent the balance payable.

Specimen of an account in Ledger

A/c of M/s Pitambar Book Depot, New Delhi.

1978 15 Feb.	To cash paid	375-00	1978 8 Feb.	By purchase of books	452-40
28 Feb.	To balance carried over	172-50	28 Feb.	By purchase of books	95-10
		547-50			547-50
			1 March	By balance	172-50

3. Stock Book In this book Satish will keep the account of every book or item of stationery, etc., in stock. Whenever books are received they are entered on the receipt side. Whenever these are sold they are entered on the issue side, the balance will show the stock left with Satish. The stock book will serve as a check on any theft, etc.

After a certain period say a year or six months every society prepares its income and expenditure account. On the income side are entered various receipts such as grants, amount received as membership fee, sale of goods, etc. On the expenditure side are entered the various amounts spent on different heads. A specimen of such account of the school society prepared by Satish is given below :

Income and Expenditure Account of School Book Shop for the period 1st Jan. 1978 to 30th June 1978.

Income		Expenditure	
Grant	500-00	Purchase of Books	1580-00
Sale of Books	1870-30	Purchase of Stationery	390-90
Sale of Stationery	440-80	Stationery used in Shop	12-00
		Wages for cleaning the shop	2-00
		Freight and railway hire on Book received	5-45
		Excess of Income over expenditure	820-75
	2811-10		2811-10

Exercise 60

1. Suppose you are the manager of the school canteen. Prepare a specimen of cash-book you would maintain. Prepare also an income and expenditure account for a month.

2. Complete and balance the Cash-Book of Shri Ram Singh for the month of January 1979 from the following particulars :

Date	Particulars	Amount
1	Shri Ram Singh received his salary	*Rs* 547 85
2	Rent paid for Dec. 1969	*Rs* 77·00
8	School fees of children	*Rs* 13·80
15	Paid Electric charges	*Rs* 6·65
20	Received D.A. Arrears	*Rs* 35·47
28	On amusement	*Rs* 11·75

Preparation of Family Budget

Family budget means an estimate of the income and its distribution under the various heads of expenditure. It is of utmost importance that the family budget should be prepared as the cost of living is going up day by day. If we prepare our family budget and adhere to it while spending our income we can avoid the possibility of getting into debt. Also we can save something for any unforeseen expenditure.

The expenditure of an average family can be divided under the following heads :

1. Food. 2. Clothing. 3. Education. 4. Health.
5. House expenses. 6. Amusement. 7. Miscellaneous.

The percentage of income spent on the various items varies with family to family. Whereas a rich family will spend more on education or house expenses, the expenditure of a poor family will be mainly on food and clothing. Hence the distribution of the family income on various heads of expenditure will depend on the needs of the family. What is important is that we should plan our expenses so that our important needs are fulfilled and we may not be led to a position under which we may be forced to take loan for our necessities of life.

Another thing to be noted while planning our expenditure is that a part of our income, say 10%, must be saved and invested in some post office savings bank or at a bank. This saving would help us in time of need.

Exercise 61

1. What are the advantages of making a family budget ? What are the various heads of expenditure you would consider while preparing your family budget ?

2. Mrs. Nirmal Gupta gets *Rs* 1300 with which she manages the house. She spends 35% on kitchen, 15% on house, 10% on education, 15% on clothes, 4% on health, 5% on amusement, 5% on miscellaneous expenses and saves 11%.

Show all the calculations and the amount spent on separate heads of expenditure.

3. Shri Shiv Prasad had a monthly income of *Rs* 3000. He arranged his expenditure as below :

Kitchen 30%, House 20%, Clothes 12%, Education 10%, Health 4%, Amusement 4%, Travelling 5%, Miscellaneous 3% and Savings 12%.

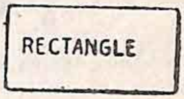
Make a detailed budget for a month.

□

14

Measurement of Area

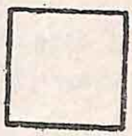
1. Rectangle. A rectangle is a plane figure bounded by four sides having its *opposite sides equal* and *all angles right angles.*



Thus the page of this book, the floor of a room the faces of a brick, are all rectangles.

The sides of a rectangle are usually called its **length** and **breadth.**

Square. A square is a plane figure bounded by *four equal sides* having *all its angles right angles.*



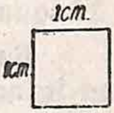
SQUARE

The **Perimeter** of a rectangle is the sum of all its sides.

Clearly,

Perimeter of a rectangle $=2$ (length $+$ breadth) and perimeter of a square $=4\times$side.

2. A square centimetre is the amount of surface enclosed within a square of which each side in one centimetre in length.

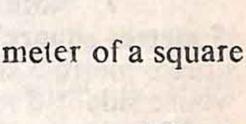


The terms *square metre, square hectometre, square kilometre, etc., are used in the same sense.*

The **area** of any figure is the *amount* of surface enclosed within its bounding lines. This is measured by the number of square *cm* or square metres (or other units of square measure) it contains.

3. *To find the area of a rectangle whose* **length** *and* **breadth** *are given.*

The accompanying figure is a rectangle 5 *cm* long and 3 *cm* broad. Each side is divided into centimetres and the points of division are joined by straight lines. The rectangle has thus been divided up into a number of squares, each 1 square centimetre in area. It will be seen from the figure that there are three rows each containing 5 squares.



Therefore, the rectangle contains 5×3 **square centimetres.**

Hence, the area of a rectangle is given by the formula.

Area = length × breadth square units

or $A=l\times b$ square units,

where A stands for the area of the rectangle, and l and b stand for the length and breadth respectively.

4 From the formula $A = l \times b$, we get

(*i*) $l = \frac{A}{b}$; (*ii*) $b = \frac{A}{l}$.

5. In the case of a square,

$\therefore$ $l = b$ $\therefore$ (*i*) $A = l^2$; (*ii*) $l = \sqrt{A}$.

6. **Measure of Area (*Metric System*)**

100 square millimetres = 1 square centimetre
100 square centimetres = 1 square decimetre
100 square decimetres = 1 square metre
100 square metres = 1 square dekametre
100 square dekametres = 1 square hectometre
100 square hectometres = 1 square kilometre
100 square kilometres = 1 square myriametre

Note. One square hectometre which is equal to 10000 square metres is called *hectare*. The unit of area is the square metre in the metric system.

7. **Note carefully that '5 square metres'** is quite different thing from **'5 metres square'**. '5 square metres' represents an area which contain one square metre 5 times ; whereas '5 metres square' denotes the area of a square whose side is 5 metres long and which, therefore, contains 5 × 5 square metres or 25 square metres.

Ex. 1. The length of a rectangle is 4 metres and its breadth is 3 metres. Find its area.

Sol. Length of the rectangle = 4 metres
Breadth of the rectangle = 3 metres
$\therefore$ area of the rectangle $= 4 \times 3$ sq. metres = 12 sq. metres. *Ans.*

Ex. 2. Find the perimeter of a rectangular ground if it is 15 metres long and 10 metres wide.

Sol. Length of the ground = 15 *m.*
Breadth of the ground = 10 *m.*
$\therefore$ its perimetre $= 2 \times (15 + 10)$ metres = 50 metres. *Ans.*

Ex. 3. Find the area of a square whose side is 3 centimetres.

Sol. Side of the square = 3 *cm.*
its area = (3×3) sq. *cm* = 9 sq. *cm.* *Ans.*

Exercise 62

Find the areas of the following rectangles :

1. Length = 8 metres ; Breadth = 5 metres.
2. ,, = 12 metres ; ,, = 8 metres.

3. Length=13 metres ; Breadth =10 metres.

4. ,, =86 metres ; ,, =59 metres.

5. ,, =2 *m* 15 *cm* ; ,, = 1 *m* 85 *cm.*

6. Find the area of a square whose side is 75 metres.

7. Find the area of a square whose side is 2 metres 5 centimetres.

8. Find the side of a square whose perimeter is 184 *m.*

9. Find the perimeter of that rectangle whose length is 13 *m* 5 *cm* and breadth is 8 *m* 2 *cm.*

10. Find the perimeter of a playground which is 84 *m* long and 40 *m* 25 *cm* wide.

11. Find the length of the rectangular field whose perimeter is 90 metres and breadth is 20 metres.

12. Find the breadth of that rectangle whose length is 42 *m* 50 *cm* and perimeter is 140 metres.

13. Find the area of a square whose perimeter is 60 metres.

14. The perimeter of a square field is 400 metres. What is its area ?

15. A rectangular field is 1210 metres in length and 660 metres in breadth. What is its area ?

16. The side of a square field is 89 metres. By how many square metres does its area fall short of a hectare ?

Ex. 1. The area of rectangular field is 144 sq. metres. Find its length if it is 9 metres wide.

Sol. Area of the field=144 sq. metres.

Breadth of the field=9 metres.

∴ its length$=\frac{144}{9}$ metres=16 metres. *Ans.*

Ex. 2. Find the side of a square whose area is 144 sq. *cm.*

Sol. Area of the square=144 sq. *cm.*

∴ its side $=\sqrt{144}$ *cm*=12 *cm.* *Ans.*

Exercise 63

1. The area of a rectangle is 1144 sq metres. Find its length if its breadth is 22 metres.

2. A rectangular piece of ground is 49 metres wide. Find its length if its area is 3185 sq. metres.

3. A rectangle is 84 metres long. Find its breadth if it is 2058 sq. metres in area.

4. The area of a rectangle is 50924 sq. metres Find its breadth if it is 400 metres long.

5. Find the side of a square whose area is 289 sq. *m*.

6. Find the side of a square whose area is 380·25 sq. *m*.

---

8. Easy Problems on Area

Ex. 1. How many metres of carpet 75 *cm* wide will be required to cover the floor of a room which is 12 metres long and 8 metres wide ?

Sol. Length of the room = 12 metres.

Breadth of the room = 8 metres.

∴ Area of the room $= 12 \times 8$ sq. metres = 96 sq. metres.

The area of the carpet will be equal to the area of the room.

∴ Area of the carpet = 96 sq. metres.

Width of the carpet = 75 $cm = \frac{3}{4}\ m$.

Hence the length of the carpet $= (96 \div \frac{3}{4})\ m$

$= 96 \times \frac{4}{3}\ m = 128$ metres.

Ex. 2. How many paving stones, each measuring $2\frac{1}{2}$ metres by 2 metres will be required to pave a rectangular piece of ground 30 metres by $16\frac{1}{2}$ metres ?

Sol. Length of the ground = 30 metres.

Breadth of the ground $= \frac{33}{2}$ metres.

∴ Area of the ground $= 30 \times \frac{33}{2}$ sq. $m = 495$ sq. metres

Area of each stone $= \frac{5}{2} \times 2$ sq. metres = 5 sq. metres.

∴ Number of stones required $= \dfrac{\text{area of the ground}}{\text{area of a stone}} = \dfrac{495}{5} = 99.$ *Ans.*

Ex. 3. Find the cost of wiring round a rectangular field 30 metres by 20 metres at the rate of 15 *P* per metre.

Sol Length of the field = 30 metres.

Breadth of the field = 20 metres.

The length of the wire required will be equal to the perimeter of the field.

∴ the length of the wire $= 2(30 + 20)$ metres = 100 metres.

Cost of 1 metre of wire = 15 *P*.

∴ Cost of 100 metres of wire $= 100 \times 15\ P = Rs\ 15.$ *Ans.*

Exercise 64

1. Find the cost of cementing a court-yard 28 *m* by 16 *m* at 16 *P* per sq. metre.

2. How many metres of carpet 75 *cm* wide will be required to cover a floor 27 *m* by 16 *m* ?

3. What will be the cost of wiring round a rectangular field $37\frac{1}{2}$ *m* by 20 *m* at the rate of 25 *P* per metre ?

4. How many students can sit in a room measuring 10 *m* by 6 *m*, supposing each student to require a space of 1 *m* by $\frac{2}{3}$ *m* ?

5. Find the cost of erecting a fence round the field 37 *m* by 25 *m* at the rate of 30 *P* per metre.

6. What will be the cost of erecting a fence round a square piece of ground whose side is 30 *m* at the rate of *Rs* 10·40 per 100 metres ?

7. How many postage stamps 2 *cm* long and $1\frac{1}{2}$ *cm* wide will be required to cover a board of paper 6 *dm* long and 2 *dm* wide ?

8. How many paving stones, each measuring 10 *dm* by 9 *dm* are required to pave a verandah 60 metres by 6 metres.

9. How many planks $10\frac{1}{2}$ *m* long and $3\frac{2}{3}$ *dm* broad will be required for the ground whose length is 42 metres and breadth 11 metres ?

10. How many metres of carpet 60 *cm* wide will be required to cover a floor 25 metres long and 18 metres wide ? What will be the cost of this carpet at *Rs* 1·20 a metre ?

11. Find the cost of covering a floor 8 4 *m* by 5·5 *m* with carpet 7 *dm* wide at *Rs* 2·40 a metre.

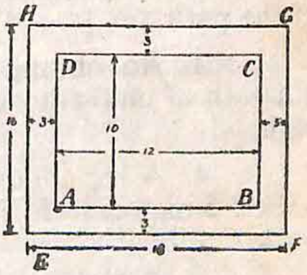
12. How many rectangular tiles 10 *cm* by 7 *cm* will be required to cover a floor 14 *m* long and $12\frac{1}{2}$ *m* broad and what will be the cost at *Rs* 7 per hundred tiles ?

* * *

9. Verandah round a room

Ex. A rectangular hall 12 metres long and 10 metres broad is surrounded by a verandah 3 metres wide. Find the area of the verandah.

Sol. Let ABCD represent the hall and EFGH the verandah which is 3 metres wide.



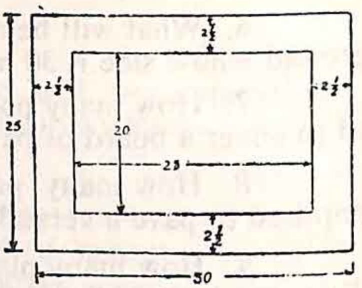
For hall—
Length (AB) $=12$ *m*
Breadth (BC)$=10$ *m*

$\therefore$ Area of the inner rectangle ABCD (hall)$=12\times10$ sq. *m* $=120$ sq. *m*.
For Verandah—Length (EF)$=(12+2\times3)m=18$ *m*.
Breadth (EF)$=(10+2\times3)$ *m*$=16$ *m*.
$\therefore$ Area of outer rectangle EFGH$=18\times16$ sq. *m* $=288$ sq. *m*.

Area of the verandah
$=$(Area of the outer rectangle)$-$(Area of the inner rectangle)
$=288$ sq. *m*-120 sq. *m*$=168$ sq. *m*. *Ans.*

10. Path inside a garden

Ex. A rectangular garden 30 metres long and 25 metres wide has a path $2\frac{1}{2}$ *m* wide running all-round inside it. Find the area of the path.



Sol. Let the outer rectangle represent the garden and the inner rectangle the portion of the garden surrounded by the path

For outer rectangle

Length $=30$ *m*

Breadth $=25$ *m*

$\therefore$ Area of the outer rectangle $=30\times 25$ sq. $m=750$ sq. m.

Width of the path $=\frac{5}{2}$ m.

Then the length of the inner rectangle $=(30-2\times\frac{5}{2})$ $m=25$ m.

The breadth of the inner rectangle $=(25-2\times\frac{5}{2})$ $m=20$ m.

$\therefore$ Area of the inner rectangle $=25\times 20$ sq. $m=500$ sq. m.

Now area of the path

$=$(area of the outer rectangle)$-$(area of the inner rectangle)

$=750$ sq. $m-500$ sq. $m=250$ sq. m. *Ans.*

Exercise 65

1. A rectangular room 10 metres long and 8 metres broad is surrounded by a verandah 2 metres wide. Find the area of the verandah.

2. A rectangular garden is 500 metres long and 400 metres wide : a path of uniform width of 5 metres runs round it on the inside. Find the area of the path.

3 An oblong garden, 63 metres long and 54 metres broad, has within it a path of uniform width of 3 metres running round it. Find the area of the path.

4. A rectangular plot of grass, 25 metres by 22 metres, has a gravel walk 1·5 metres wide all-round it on the outside. Find the area of the gravel walk.

5. A rectangular garden 78 metres long and 35 metres broad has a uniform path 1 metre wide all-round it on the outside. Find the area of the path.

6. A room measures 12 metres by $8\frac{1}{2}$ metres on the outside. Find the area of the floor of the room if the walls are 75 *cm* thick.

7. Find the area of the path $2\frac{1}{2}$ metres wide, which runs inside a rectangular garden 60 metres by 57 metres.

8. A rectangular room 12 metres by 10 metres is surrounded by a verandah 3 metres wide. Find the number of bricks 25 *cm* by 12 *cm* needed to pave the verandah.

9. Calculate the cost, at 57 *P* per sq. *m* of carpeting a floor 20 *m* by 16 *m*, leaving a margin of $1\frac{1}{2}$ *m* uncovered all-round.

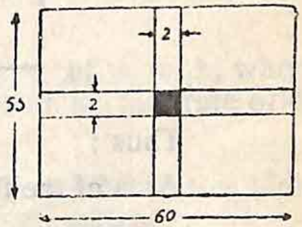
10. A garden 360 metres long and 300 metres broad has a path 10 metres wide all-round inside. Find the cost of matting it at 3 paise per sq. metre.

---

11. Paths crossing each other

Ex. An oblong garden measures 60 metres by 55 metres. From the centre of each side a path 2 metres wide goes across to the centre of the opposite side. Find the area of the paths.

Sol. Area of the path along the length.
$=60\times2$ sq. metres $=120$ sq. metres.
Area of the path along the breadth
$=55\times2$ sq. metres $=110$ sq. metres.
Area of the portion common to both the paths
$=2\times2$ sq metres $=4$ sq. metres.
$\therefore$ area of the paths $=(120+110-4)$ sq. metres
$=226$ sq. metres. *Ans.*



Exercise 66

1. An oblong garden is 600 metres long and 450 metres wide. It has two roads, each 3 metres wide, running midway within it, one parallel to the length and the other parallel to the breadth Find the area of the roads.

2. A rectangular plot of land is 300 metres long and 250 metres broad. It has two roads, each 3 metres wide running midway within it, one parallel to the length and the other parallel to the breadth. Find the area of the roads; also calculate the cost of constructing the roads at *Rs* 5 per sq. metre.

3. A rectangular garden is 150 metres long and 140 metres wide It has two roads, each 1 metre 50 *cm* wide, running midway within it, one parallel to the length and the other parallel to the breadth. Find the area of the roads and the cost of repairing the roads at *Re* 1. 20 *P* per sq. metre.

4. A rectangular piece of ground is 45 metres long and 30 metres wide It has two roads, each 1 metre wide, running midway within it, one parallel to the length and the other parallel to the breadth. Find the area of the roads ; also calculate the area of the remaining space.

---

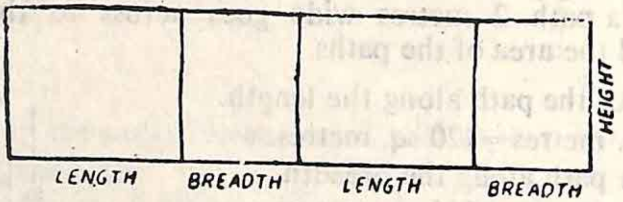
12. Area of the walls of a room

A room has three dimensions, *i.e.*, length, breadth and height. So far we have considered only two, *i.e.*, length and breadth. Now we shall make use of the third dimension, *i.e.*, the height in calculating the area of the walls of a room.

A room has six surfaces *i.e.*, the floor, the ceiling and the four walls. The area of the ceiling is equal to the area of the floor. Hence,

Area of the ceiling = length × breadth (Units of area)

Now let us consider the area of the four walls of a room. Suppose the room is made of thin cardboard. Removing its base and roof, we are left with only the four walls. Now cut it along its height through a corner; then it can be spread out into one continuous rectangle (shown below) whose length is the perimeter of the room and whose breadth is the height of the room.



Thus :

Area of the four walls = perimeter × height (Units of area)
= 2(**length + breadth**) × **height**(Units of area)

or Area of the four walls $= 2(l+b) \times h$ square units

Ex. 1. A room is 7 metres long, 5 metres broad and $3\frac{1}{2}$ metres high. Find the area of the four walls of the room. Also calculate the cost of white-washing the walls at 15 *P* per sq. metre.

Sol. Length of the room = 7 metres.
Breadth of the room = 5 metres.
Height of the room = $3\frac{1}{2}$ metres.
∴ Area of the walls $= 2(7+5) \times \frac{7}{2}$ sq. metres = 84 sq. metres. *Ans.*
Cost of white-washing 1 sq. metre = 15 *P*
∴ " " " 84 sq. metres $= 84 \times 15$ *P* = *Rs* 12. 60 *P*. *Ans.*

Ex. 2. A room is 8 metres long, 6 metres broad and 3 metres high. It has 2 windows $1\frac{1}{2}\ m \times 1\ m$ and a door $2\ m \times 1\frac{1}{2}\ m$. Find the cost of papering the walls with paper 50 *cm* wide at 25 *P* per metre.

Sol. Length of the room = 8 metres.
Breadth of the room = 6 metres.
Height of the room = 3 metres.
∴ Area of the four walls $= 2(8+6) \times 3$ sq. metres = 84 sq. metres.
Area of 2 windows $= 2 \times \frac{3}{2} \times 1$ sq. metres = 3 sq. metres.
Area of the door $= 2 \times \frac{3}{2}$ sq. metres = 3 sq. metres
Area of the 2 windows and the door $= (3+3)$ sq. metres = 6 sq. metres.
∴ Area to be covered $= (84-6)$ sq. metres = 78 sq. metres
Breadth of the paper = 50 *cm* $= \frac{1}{2}$ metre.

∴ Length of the paper $=78 \div \frac{1}{2}$ metres$=156$ metres.

Cost of 1 metre of paper $=25$ *P*.

∴ Cost of 156 metres of paper$=156 \times 25$ *P* $=$ *Rs* 39. *Ans.*

Exercise 67

1. Find the cost of painting the walls of a room 5 metres long, 4 metres broad and 3 metres high at 45 per sq. metre.

2. Find the cost of papering the walls of a hall 18 metres long, 12 metres wide and 8 metres high at the rate of 20 *P* per square metre.

3. Find the cost of painting the walls and ceiling of a room 6 *m* long, 5 *m* broad and $3\frac{1}{2}$ *m* high at *Rs* 2·25 per square metre.

4. Find the cost of painting the sides and bottom of a tank, whose length is 4 metres, breadth is $3\frac{1}{2}$ metres and depth is 4 metres, at the rate of 48 *P* per sq. metre.

5. A room is 5·5 metres long, 4 metres broad and 2·5 metres high. Find the cost of papering its walls and ceiling at 30 *P* per sq. metre.

6. A hall is 20 metres long, 16 metres wide and 8 metres high. Find the total cost of papering its walls at 18 *P* per sq. metre and painting its ceiling at *Re* 1. 20 *P* per sq. metre.

7. A closed box measures 2 metres by $1\frac{1}{2}$ metres by 1 metre externally. Find the cost of painting its outside at *Re* 1. 15 *P* per sq. metre. (The bottom is not painted).

8. How many metres of wall paper 2 metres wide will be required for a room 7 metres long, 5 metres wide and 3 metres high ?

9. How many metres of wall paper 1·5 metres wide will be required for a room 6 metres long, 5 metres wide and 3 metres high ?

10. Find the cost of papering the walls of a room 2 metres by 7 metres by 4 metres with paper 50 *cm* wide at *Rs* 1·50 per metre, a deduction of 15 sq. metres being made for windows, etc.

11. A hall is 20 metres long, 16 metres broad and 9 metres high. It has 8 ventilators each $1\frac{1}{2}\ m \times 1\ m$, 6 windows each $2\ m \times 1\frac{1}{2}\ m$ and 4 doors each $3\ m \times 2\ m$. Find the cost of papering its walls at *Rs* 3·25 per sq. metre.

12. Find the expenses of papering a room, whose length is 7·2 metres, breadth 6·3 metres and height 4 metres with paper half a metre wide at 18 *P* per metre allowing for a door 1·8 *m* by 1·5 *m* and 4 windows, each 1 *m* by ·7 *m*.

13. A room is 7 metres long, 6 metres wide and $3\frac{1}{2}$ metres high. It has 2 windows each $1\frac{1}{2}\ m \times 1\ m$ and a door $2\ m \times 1\frac{1}{2}\ m$. Find the cost of painting its walls and ceiling at 75 *P* per square metre.

14. A room is 6·5 metres long, 5 metres wide and 4 metres high. It has a window $1\,m \times \cdot 6\,m$, a ventilator $\cdot 5\,m \times \cdot 4\,m$ and two doors each $2\,m \times 1\frac{1}{2}\,m$. Its walls and ceiling are to be papered with 40 *cm* wide paper. Find the cost of papering at the rate of 60 *P* per metre.

15. Find the cost of painting the ceiling of a room 6 metres long, 4 metres wide and 3·5 metres in height at *Rs* 2 per sq. metre and also the cost of white-washing the four walls at 50 paise per sq metre.

□

15

Measurement of Volume

CUBE AND CUBOID

1. Anything which occupies space is called a solid.

A sheet of paper, the water in a cup, the air inside a football, etc., are all solids in the geometrical sense.

A solid figure bounded by six rectangular faces of which every two opposite sides are equal and parallel is called a **rectangular solid** or a **cuboid**, [*e.g.*, a brick, See Fig. (*i*)].

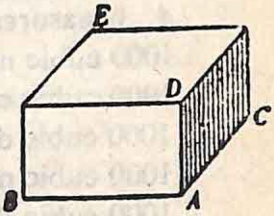


Fig. (*i*)

A **cube** is a rectangular solid bounded by six equal square faces ; as a die in Fig. (*ii*).

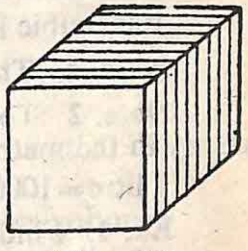
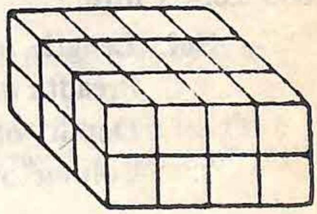


Fig. (*ii*)

A **cubic unit** (*i.e.*, cubic metre, cubic centimetre, etc.) is a cube each of whose edges is one unit (*i.e.*, metre or centimetre, etc.) of length.

The **Volume** of a solid is the amount of space enclosed within its bounding faces and is measured by the number of cubic units (cub. *m*, cub. *cm* etc.) which it contains.

2. To find the volume of a cuboid *whose length, breadth and height are given.*



The figure given here shows a cuboid 4 *cm* long, 3 *cm* broad and 2 *cm* high. Each side is divided into centimetres and the points of division are joined by straight lines. The solid has thus been divided up into a number of cubic centimetres.

It will be seen from the figure that there are 2 layers of cubes with the same number in each layer. The number of cubes in the top layer is 4×3 because there are 3 rows of cubes and 4 cubes in each row. There are as many in the bottom layer. Therefore, the number of cubes in the solid is $4 \times 3 \times 2$, *i.e.*, the volume of the solid is $4 \times 3 \times 2$ or 24 cubic centimetres.

Hence the volume of a rectangular block or cuboid is given by the formula—

Volume=length × breadth × height cubic units or $V = l \times b \times h$

where V stands for the number of cubic units in the volume of the cuboid ; l, b, h stand for units of length, breadth and height respectively.

3. In the case of a cube, $l = b = h$. $\therefore$ $V = l \times l \times l = l^3$.

That is, **the volume of a cube**=(edge)^3.

Note. In using this formula care must be taken that the units of the length and volume correspond. If l, b, h are all expressed in metres, then V will be expressed in cubic metres.

4. Measures of volume (*Metric System*)

1000 cubic millimetres = 1 cubic centimetre
1000 cubic centimetres = 1 cubic decimetre
1000 cubic decimetres = 1 cubic metre
1000 cubic metres = 1 cubic dekametre
1000 cubic dekametres = 1 cubic hectometre
1000 cubic hectometres = 1 cubic kilometre
1000 cubic kilometres = 1 cubic myriametre.

Note. 1. The unit of volume is the cubic metre in the metric system.

Note. 2 To measure liquids, we use measures of capacity. The unit of capacity in the metric system is litre.

1 litre = 1000 cubic centimetres.

Ex. 1. Find the volume of a slab of stone measuring 4 metres in length, 2 metres in width and $\frac{1}{4}$ metre in thickness.

Sol. Length of the slab = 4 metres. Width of the slab = 2 metres.
Thickness of the slab = $\frac{1}{4}$ metre.

$\therefore$ Volume of the slab $= 4 \times 2 \times \frac{1}{4}$ cubic metres = 2 cubic metres. *Ans.*

Ex. 2. A rectangular tank measures internally 25 metres in length, 20 metres in breadth and 8 metres in depth. Find its capacity of holding water if 1000 c.c. = 1 litre.

Sol. Length of the tank = 25 metres.
Breadth of the tank = 20 metres.
Depth of the tank = 8 metres.

$\therefore$ Volume of the tank $= 25 \times 20 \times 8$ cubic metres

$= 4000$ cubic metres $= 4000 \times 1000000$ cubic *cm.*

$\because$ 1000 c c. $= 1$ litre

$$\therefore\ 4000 \times 1000000 \text{ c.c.} = \frac{1 \times 4000 \times 1000000}{1000} \text{ litres} = 4000000 \text{ litres. } \textit{Ans.}$$

Ex. 3. A brick measures 20 *cm* by 10 *cm* by $7\frac{1}{2}$ *cm*. How many bricks will be required for a wall 25 *m* long, 2 *m* high and $\frac{3}{4}$ *m* thick ?

Sol. For wall : length$=25\ m$, thickness$=\frac{3}{4}\ m$, height$=2\ m$.

$\therefore$ Volume of the wall$=25\times\frac{3}{4}\times2$ cubic metres$=\frac{75}{2}$ cubic metres.

For brick : length$=20\ cm=\frac{20}{100}\ m=\frac{1}{5}\ m$.

breadth$=10\ cm=\frac{10}{100}\ m=\frac{1}{10}\ m$.

$$\text{thickness}=\tfrac{15}{2}\ cm=\frac{15}{2\times100}\ m=\frac{3}{40}\ m.$$

$\therefore$ Volume of the brick$=\frac{1}{5}\times\frac{1}{10}\times\frac{3}{40}$ cubic metre$=\frac{3}{2000}$ cubic metre.

$$\text{Number of bricks}=\frac{\text{volume of the wall}}{\text{volume of a brick}}=\tfrac{75}{2}\div\tfrac{3}{2000}=\tfrac{75}{2}\times\tfrac{2000}{3}$$

$$=25000.\quad \textit{Ans.}$$

Exercise 68

Find the volume of the rectangular blocks whose measurements are :

1. Length 5 *m*, breadth 4 *m*, height 3 *m*.
2. Length 8 *m*, breadth 3 *m*, height $1\frac{1}{2}$ *m*.
3. Length 16 *m*, breadth 3·5 *m*, height 2 *m*.
4. Length 3·5 *m*, breadth 2·2 *m*, height 2 *m*.
5. Length 4 *m* 25 *cm*, breadth 3 *m*, height 2 *m* 15 *cm*.
6. Find the volume of a cube whose edge is 15 metres.
7. Find the volume of a cube whose edge is 25 metres.
8. A rectangular block of stone measures 20 *dm* in length, 18 *dm* in breadth and 9 *dm* in height. What is the volume ?
9. A cuboid measures 22 *cm* by 10 *cm* by 7 *cm*. Find its volume.
10. How many cubic metres of masonry are there in a wall 81 metres long, 4 metres high and ·2 metre thick ?
11. A tank is 20 metres by 15 metres by 7 metres. Find its capacity of holding water if 1000 c.c.$=1$ litre.
12. A beam is 8 metres long, 0·5 metre broad and 0·2 metre thick. What will be its cost at *Rs* 70 per cubic metre ?
13. A beam is 12 metres long, 75 *cm* thick and 80 *cm* broad. What is its cost at *Rs* 2.25 per cubic metre ?
14. Find the volume of earth dug out from a tank 12 *m* by 8 *m* by 5 *m* ; also find the cost of digging it at *Re* 1. 50 *P* per cubic metre.
15. The length of a room is 12 metres, width 8 metres and height 6 metres. How many boxes will it hold if each box is allowed a space of 1·5 cubic metres ?
16. A brick measures 2·3 *dm* by 1·1 *dm* by 0·8 *dm*. How many bricks will be required for a wall 92 metres long, 4 metres high and ·264 metre thick ?

5. To find the Surface of a Cuboid

Fig. (*i*) given on Page 85, shows a cuboid of which the length, breadth and height are l, b, h, units respectively.

Since the cuboid has *six* rectangular faces and the opposite faces are equal, the whole surface of the cuboid will be found by doubling the sum of the area of the faces DE, DB, DC.

Now the faces DE, DB, DC contain respectively lb, lh, bh, units of area.

$\therefore$ **Whole Surface of a Cuboid** $=2(lb+lh+bh)$.

6. A cube has six square faces.

$\therefore$ the whole surface of a cube $=6\times(\text{edge})^2$.

Ex. 1. Find the suface of (*i*) a cuboid 4 metres long, 2 metres broad and 50 *cm* thick ; (*ii*) a cube whose edge is 2 metres.

Here $l=4\ m$, $b=2\ m$ and $h=\frac{1}{2}\ m$.

Sol. (*i*) Surface$=2(lb+lh+bh)$

$=2(4\times2+4\times\frac{1}{2}+2\times\frac{1}{2})$ sq. metres$=22$ sq. metres. *Ans.*

(*ii*) Here edge$=2$ metres.

Surface$=6\times(2)^2$ sq. metres$=24$ sq. metres. *Ans.*

Exercise 69

1. Find the surface of a cube whose edge is 15 metres.
2. Find the surface of a cube whose edge is 25 *cm*.
3. Find the surface of a cuboid which measures 2 *cm* by 3 *cm* by 4 *cm*.
4. Find the surface of a cuboid whose measurements are 36 metres, 12 metres and 1 metre.
5. Find the cost of painting the box measuring 8 *m*, 6 *m* and 4 *m* externally if the cost of painting is *Rs* 5 per sq. metre.

* * *

7. From the formula $V=l\times b\times h$, we get

(*i*) $l=\dfrac{V}{b\times h}$, (*ii*) $b=\dfrac{V}{l\times h}$, (*iii*) $h=\dfrac{V}{l\times b}$.

Ex. The volume of a cuboid is 144 cubic metres. Find its height, if it is 8 metres long and 6 metres wide.

Sol. Volume$=144$ cubic metres, Length$=8$ metres. Breadth$=6$ metres.

$\therefore$ Height$=\dfrac{144}{6\times8}\ m=3\ m.$ *Ans.*

Exercise 70

1. The volume of a cuboid is 1,440 cubic *cm*. Find its height, if it is 15 *cm* long and 12 *cm* wide.

2. Find the breadth of a tank which can hold 280 cubic metres of water if its length and depth are 7 *m* and 4 *m* respectively.

3. A tank 12 *m* and 8 *m* was dug to a certain depth and the volume of earth dug out was found to be 480 cubic metres. Find the depth of the tank.

4. If 210 cubic metres of water be poured into an empty tank 12 metres long and 5 metres wide, find the height to which the water level will rise.

5. What length must be cut off a straight plank 2·5 metres broad and ·025 metres thick in order that it may contain ·25 cubic metre ?

6. A beam is 12 *m* long and ·75 *m* thick. What is its breadth if the cost at *Rs* 75 per cubic metre is *Rs* 202·50 ?

16

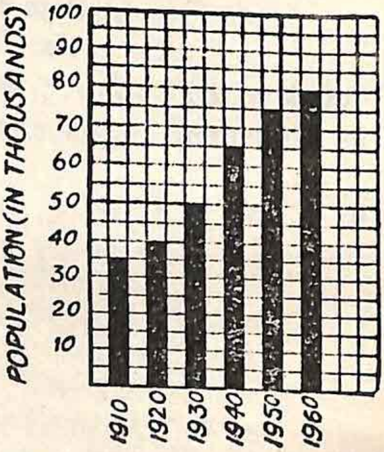
Graphs

1. Most of the people in reading a daily newspaper or a scientific article either skip over the columns of figures and tables altogether or have a hazy idea about them. Moreover these figures do not have a lasting effect on their brains. But when these facts are *pictured* for them, they notice many important things and take interest in reading.

Graphs are picture-methods of representing figures and making comparisons between them. There are four main kinds of graphs :

(*i*) Bar or Column graphs.
(*ii*) Broken line graphs.
(*iii*) Curved line graphs.
(*iv*) Straight line graphs.

(*i*) **Bar or Column Graphs** The simplest and the most widely used graph is the bar graph. With its help, we compare simple magnitudes. The bar graph shown here represents the population of a town in various years as given in the following table :



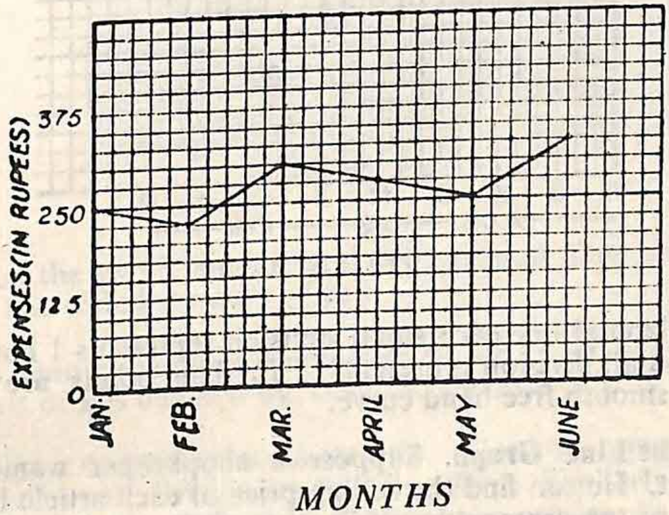
Year	1910	1920	1930	1940	1950	1960
Population (in thousands)	35	40	50	65	75	80

The horizontal lines represent the years and the vertical lines, the population found in thousands. The tops of the various columns give the population in a particular year.

(*ii*) **Broken Line Graphs.** If instead of drawing bars in a bar diagram, we simply mark the points where the top of each bar would reach and then join these points by straight lines, we shall get a *broken line graph* This type of graph is used where the changes take place abruptly and not according to some law.

Ex. 1. The following table gives the expenses of a certain family for six months. Represent them with the help of a broken line graph.

Month	January	February	March	April	May	June
Expenses (in *Rs*)	250	225	300	275	250	325



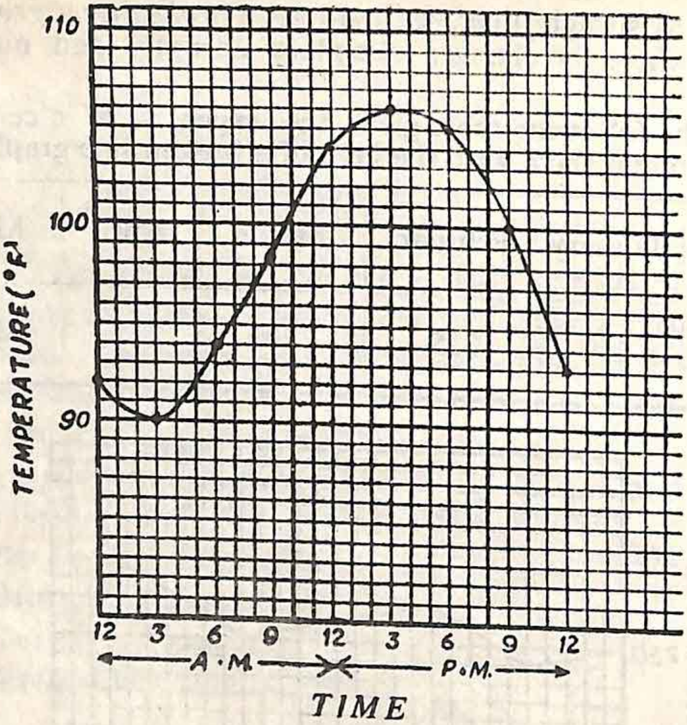
On the horizontal line 5 small divisions represent a month and on the vertical line, one small division represents *Rs* 25. The points plotted are joined by straight lines to get a broken line graph.

(*iii*) **Curved Line Graphs** If the variable changes gradually or according to some law, the points can be joined with the help of a smooth curve. This type of graph tends to even out abrupt changes.

Ex. 2. The following figures show the Dry Bulb temperature at a particular place for 24 hours. Represent them with the help of a curved line graph.

Time	12 night	3 A.M.	6 A.M.	9 A.M.	12 noon	3 P.M.	6 P.M.	9 P.M.	12 night
Temp. (in F)	92	90	94	98	104	106	105	100	93

Sol.



On the horizontal line each small division represents 1 hour and on the vertical line, each small division represents 1°F. The points are plotted and then joined with a smooth free hand curve.

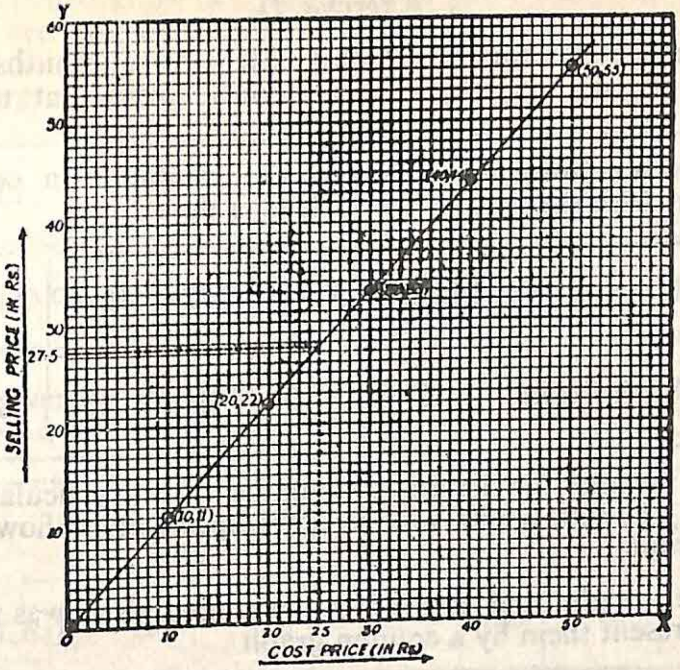
(*iv*) **Straight Line Graph.** Suppose a shopkeeper wants to sell his goods at 10% profit. He can find the selling price of each article by the method of 'profit and loss' or 'percentage' but if he draws the straight line graph, he can find the selling price easily with the help of this graph.

Method. Choose five or six convenient cost prices and calculate their corresponding selling prices ; then write them down in the form of a table, thus

Cost price (in *Rs*)	10	20	30	40	50
Selling price (in *Rs*)	11	22	33	44	55

(10, 11) ; (20, 22) ; (30, 33) ; (40, 44) ; (50, 55) are called *number pairs.*

The known qnantities (cost price) are placed at the top of the table and their corresponding unknown quantities (selling price) below them.



Now on the graph paper select a horizontal line called the *axis* of *x* and a vertical line called the *axis* of *y*.

Let us denote the point of intersection of these axes by 'O' called the origin The axis of *x* is denoted by 'OX' and the axis of *y* by 'OY'.

We select a convenient scale for axis. Here we represent the cost price along *x*-axis, each small division representing *Re* 1. Similarly we represent the selling price along *y*-axis, each small division representing *Re* 1.

Then we plot the number pairs. Take the number pair (10, 11). This tells that 10 is to be taken along the *x*-axis and 11 is to be taken along the *y*-axis according to the respective scales. We count 10 small divisions along *x*-axis and then we move upwards 11 divisions representing 11 rupees. There we put a dot, encircle it and write (10, 11). Similarly, we plot the other pairs. We draw a straight line joining all these points. Thus we get a 10% profit graph.

Now suppose we want to find the selling price of an article which costs *Rs* 25. We find the point 25 on the *x*-axis and move upwards till we reach the graph and then turn to the left and thus reach the *y*-axis. This gives us the selling price which is *Rs* 27·50.

Note. It is clear that the selling price is directly proportional to the cost price. So whenever the relation between known and unknown quantities is that of direct proportion, the graph must pass through the origin.

Exercise 71

1. Rama's marks for the monthly tests for five months from August to December are 50, 40, 55, 60, 66 respectively. Represent these marks by a column graph.

2. Draw a column graph showing the rainfall of a certain village in different months with the help of the following data :

Month	March	April	May	June	July	Aug.
Rainfall (in *mm*)	5	0	0	10	80	120

3. My incomes for the first six months of a particular year is *Rs* 250, *Rs* 300, *Rs* 275, *Rs* 400, *Rs* 300 and *Rs* 350 respectively. Show these incomes by a column graph.

4. The weight and age of my youngest sister was recorded on each birthday. Represent them by a column graph

Age (in years)	10	11	12	13
Weight (in *kg*)	25	26	28	30

5. The average height of boys of different ages is given below in a tabular form Represent them by a broken line graph.

Age (in years)	7	8	9	10	11
Height (in *cm*)	115	122	126	130	136

6. The following figures represent the sales of a firm in six months of a year. Represent them by a broken line graph.

Month	Jan.	Feb.	March	April	May	June
Sales (in thousands of *Rs*)	103	101	93	90	117	119

7. The temperature of a town on a certain day was taken at different times and recorded as under.

Draw a graph to represent it.

Time	10 A.M	11 A.M.	12 Noon	1 P.M.	2 P.M.	3 P.M.
Temperature (in centigrade)	27°	30°	32°	33°	34°	32°

8. The average monthly expenditure of a man for the years 1957 to 1963 is given below :

Year	1957	1958	1959	1960	1961	1962	1963
Expenditure (in *Rs*)	100	120	125	135	145	150	175

Draw a curved line graph to represent this.

9. The temperature of a patient as recorded by the nurse at different times during day time is given below. Show them by a suitable graph.

Time	8 A.M.	11 A.M.	2 P.M.	5 P.M.	8 P.M.
Temperature (in °F)	95	98	100	102	101

10. The swimming pool of a school was being filled and the depth of water at various times was recorded as shown in the table below :

Time	1 P.M.	2 P.M.	3 P.M.	4 P.M.	5 P.M.	6 P.M.
Depth (in *cm*)	0	30	50	75	85	100

Draw a graph showing the depth at various times.

11. Draw a line graph to help us in converting kilograms into pounds given that 1 $kg = 2{\cdot}2$ lbs.

12. Draw a line graph which will help us in calculating daily wages of a servant who is paid *Rs* 100 a month (30 days). Calculate from it his wages for 12 days and 21 days.

13. A shopkeeper wants to sell his goods at 20 per cent profit. Draw a graph which will help him in calculating selling price of his goods. Find from it the selling price of an article which cost him *Rs* 20.

14. Given that 5 miles = 8 *km*, draw a graph for converting miles into kilometres.

□

MENTAL AGILITY TEST NO. 2

Time : 40 Minutes

Fill in the blanks :
1. 1×·1×·01=...   2. ·1×·01×·001=...   3. 1−·01 =...
4. 1−·001 =...   5. 1÷·1 =...   6. 1÷·01 =...
7. 4·7÷100 =...   8. 4·7×100 =...   9. 4·7÷1000 =...
10. 4·7×1000 =...

Express as a decimal fraction :
11. $\frac{9}{10}$ =...   12. $\frac{9}{100}$ =...   13. $\frac{34}{10}$ =...   14. $\frac{34}{100}$ =...
15. $\frac{34}{1000}$ =...   16. $\frac{43}{1000}$ =...   17. $\frac{1}{2}$ =...   18. $\frac{1}{4}$ =...
19. $\frac{1}{5}$ =...   20. $\frac{3}{4}$ =...

Express as vulgar fractions :
21. ·3 =...   22. ·33 =...   23. 3·3 =...   24. ·003 =...

Express as per cent :
25. $\frac{7}{100}$ =...   26. $\frac{3}{10}$ =...   27. $\frac{37}{100}$ =...   28. $\frac{73}{1000}$ =...
29. $\frac{1}{2}$ =...   30. $\frac{3}{20}$ =...

Express as common fractions :
31. 17%=...   32. 9% =...   33. 20% =...   34. 25% =...

Express as decimal fractions :
35. 47%=...   36. 80% =...   37. 4% =...   38. 15% =...
39. Interest on *Rs* 300 for 1 year at 7%=*Rs*...
40. Interest on *Rs* 700 for 3 years at 3%=*Rs*....
41. 1 sq. *cm*= ...sq *mm*.   42. 1 sq. *m*=....sq. *dm*
43. 100 sq. *hm*= . sq. *km*.   44. 1000 sq. *dam*=....sq. *hm*.
45. 1 cubic *cm*= . cubic *dm*.   46. 1 cubic *m*= cubic *mm*.
47. 1000 cubic *hm*=....cubic *km*.   48. 1000 cubic *dam*= .. cubic *hm*.
49. 1 litre=....cubic *cm*.   50. 10000 cubic *cm*= ...litre.

OBJECTIVE TYPE QUESTIONS—SERIES II

1. Write 'T' against the statment that is True and 'F' against the statement that is false :

(*a*) If the Selling Price is less than the Cost Price, there is always loss.

(*b*) A percentage is a fraction whose numerator is 100.

(*c*) Interest is the extra money paid for using the money borrowed or lent.

(*d*) Length and breadth can only be measure in linear measure.

(*e*) A cuboid has only two dimensions.

(*f*) In compound interest, the amount is always greater than the principal.

(*g*) When we buy goods at credit we are given a Bill.

(*h*) When we buy goods in cash we are given a Cash Memo.

(*i*) While preparing a family budget we ignore the item of savings.

2. Fill in the blanks with suitable words. The words are given in brackets.

(Profit, loss, C.P., S.P., square, rectangle, perimeter, equal, unequal principal, amount, area, volume, one, two, three)

(*a*) If the Selling Price is more than the Cost Price, there is always ......

(*b*) Profit or loss is always calculated on the........

(*c*) All the dimensions of a cube are........

(*d*) The sum of the sides of a rectangle is called its.........

(*e*) The sum of the principal and interest is called the.........

(*f*) The amount of space enclosed within the bounding faces of any solid figure is called its ....

(*g*) All the four angles of a square are..........

(*h*) A cube has six..........faces.

(*i*) A rectangle has only.......... dimensions.

3. Mark the correct answer by a tick (✓) in the space provided :

(*a*) The side of a square is 4 *cm*. Its perimeter is given by

.. A. 4 *cm* ....B. 2×4 *cm* C. 3×4 *cm* ....D. 4×4 *cm*

(*b*) The volume of cube whose edge is 3 *cm* is

...A. 3 cubic *cm* ...B. 3^2 cubic *cm* ....C. 3^3 cubic *cm* ...D. 3^4 cubic *cm* (*c*) 8 per cent can be expressed as

....A. ·8 ....B. ·8 __C. ·08 __D. ·008.

(*d*) The amount of *Rs* 500 for 2 years at 5% per annum compound interest will be

....A. $Rs\ 500\left(1+\frac{5}{100}\right)\times 2$ ....B. $Rs\ 500\left(1+\frac{5}{100}\right)^2$

__C. $Rs\ \frac{500}{100}(5\times 2)$ ....D. $Rs\ 500\times\frac{100}{105}\times\frac{100}{105}$.

(*e*) The volume of a cuboid measuring 4 *dm* by 3 *dm* by 2 *dm* will be

__A. 9 cubic *dm* ....B. 18 cubic *dm* __C. 26 cubic *dm* __D. 24 cubic *dm*

(*f*) Total surface of a cube with side 6 *cm* is given by

....A. 6^2 sq. *cm* __B. 2×6^2 sq. *cm* ....C. 4×6^2 sq. *cm* __D. 6×6^2 sq. *cm*

(*g*) If each side of a cube is doubled, its volume becomes

....A. double ....B. four times __C. six times D. eight times

(*h*) A room is 5 metres long, 4 metres broad and 3 metres high. The area of four walls is given by

__A. $(5+4+3)$ sq. *m* __B. $5\times 4\times 3$ sq. *m*

__C. $(5+4)\times 3$ sq. *m*. ....D. $2(5+4)\times 3$ sq *m*.

REVISIONAL EXERCISE – II

1. The population of a town increases 4 p.c. per year. What was the population of the town in 1973 if in 1972 it was 5625 ?

2. A student gets 55 p.c. marks in an examination. Find the total number of marks if he gets 99 marks.

3. A man purchased a house for *Rs* 32500 and sold it the same day for *Rs* 31000. Find his loss per cent.

4. A medical student has to secure 40 per cent marks to pass. He gets 40 marks and fails by 50 marks. Find the maximum number of marks.

5. 74 students from a school entered for an examination and 80 per cent of them passed. Another school sent 80 students but the number of students passed was 4 less than that of the first. Find the pass percentage of the second school.

6. Mohan bought a house for *Rs* 11725 and sold it for *Rs* 14000 after spending *Rs* 275 on its repairs. Find his gain per cent.

7. What should I charge for goods which cost me *Rs* 37·60 so as to gain $7\frac{1}{2}\%$?

8 A cycle was sold for *Rs* 131·93 at a loss of 21%. For how much was it purchased ?

9. Find the amount paid after $2\frac{1}{2}$ years if the rate of interest was $3\frac{1}{2}$ p.c. and the sum borrowed *Rs* 7700 at simple interest.

10. A person lent *Rs* 7005 to another person at $3\frac{1}{4}\%$ per annum simple interest. What interest will he get after $3\frac{1}{5}$ years.

11. I borrowed *Rs* 500 on March 3, 1968 at the rate of 5% per annum. What interest will I pay on May 15 of the same year ?

12. I deposited *Rs* 7300 in the Central Bank of India on January 1, 1970. Find the amount I got on August 7, 1970 if the rate of simple interest at that time was $2\frac{1}{2}$ per cent.

13. Find the compound interest on *Rs* 6000 at 5% for 3 years.

14. Find the compound interest on *Rs* 3200 lent at 10% per annum for two years, interest payable half-yearly.

15 A sum of money lent at compound interest for 2 years at 4% per annum amounts to *Rs* 5408. What was the sum lent ?

16. A lends *Rs* 4000 at 5% per annum for 2 years at simple interest while B lends the same amount at the same rate for the same time at compound interest. Find who gains more and by how much.

17. What are the advantages of keeping accounts ? What are the most important books of account that every person should keep ?

18. What is the need of preparing family budget ? What are the main heads of expenditure in a family budget ?

19. Prepare a cash-memo of the following purchases :

10 dozen reels of cotton at *Rs* 1·60 per dozen.

15 gross buttons at *Rs* 1·10 per gross.

12 dozen hankies at *Re* 0·40 each. 40 towels at *Rs* 1·20 each.

What is the total amount ?

20. M/s A.B. Stores, Calcutta ordered the following books from M/s Pitambar Book Depot, New Delhi. Prepare a bill to be sent to M/s A.B. Stores. Deduct 15% discount on the total amount.

15 Copies Public School Arithmetic at *Rs* 6 each.

10 Copies New Method Arithmetic No. 6 at *Rs* 3 each.

10 Copies New Style Geometry No. 6 at *Rs* 2·50 each.

10 Copies New Scheme Algebra No. 7 at *Rs* 3 each.

21. I buy the following things from a co-operative store. Prepare a cash-memo and find its total amount :

9 *kg* ghee at *Rs* 11·25 per kilogram.

3 *kg* pulses at *Rs* 2·45 per kilogram.

10 *kg* sugar at *Rs* 4·55 per kilogram.

500 gram spices at *Rs* 10·50 per kilogram.

2 *kg* salt at 30 *P* per kilogram.

22. Prepare a bill for the following and find its total amount :

$1\frac{1}{2}$ dozen eggs at 35 *P* each. 2 *kg* Cream biscuits as *Rs* 6·25 a *kg*.

$2\frac{1}{2}$ *kg* ordinary biscuits at *Rs* 4 a *kg*. $1\frac{1}{2}$ *kg* cake at *Rs* 6 a *kg*.

$1\frac{1}{4}$ *kg* toffees at *Rs* 7·60 a *kg*.

23. A square field containing 31684 sq. metres is to be enclosed with wire. Find the cost of the wire at 40 *P* per metre.

24. The area of a square field is 9 hectares. Find its side.

25. A garden is 250 metres long and 195 metres wide. It has a road 2 metres wide running all-round it on the inside. Find the cost of levelling the road at *Rs* 1·10 per sq. metre.

26. An oblong garden 175 metres long and 125 metres wide has two cross roads each 4 metres wide one parallel to the length and the other parallel to the breadth. Find the cost of paving these roads at the rate of *Re* 1. 32 *P* per sq. metre.

27. A hall is 15 metres long, 10 metres wide and 7 metres high. Find the cost of painting its interior walls at the rate of *Re* 1. 20 *P* per sq. metre.

28. The length, breadth and height of a lecture theatre are 25 *m*, 18 *m*, and 15 *m* respectively. Find the cost of painting its walls and ceiling at the rate of *Rs* 3·01 per sq. metre leaving 125 sq metres for its doors and windows.

29. A room is 11 metres long, 9 metres wide and 6 metres high. It has two doors $1\frac{1}{2}$ *m* by 2 *m* and three windows 1 *m* by ·5 *m*. Find the cost of white-washing its walls at the rate of 10 *P* per sq. metre.

30. A tank is 70 metres long, 60 metres wide and 15 metres deep. Find its capacity of holding water if 1000 c.c.=1 litre.

31. How many cubic metres of masonry are there in a wall 81 metres long, 4 metres high and ·2 metres thick ?

32. A tank contains 60000 cubic metres of water. If the length and breadth are 50 metres and 40 metres respectively, find the depth.

33. Draw a column graph to represent the average weight of boys of different ages from the following data :

Age (in yrs)	8	9	10	11	12	13
Weight (in *kg*)	28	31	33	36	40	44

34. The height and age of a boy were recorded on his each birthday. Represent them by a column graph.

Age (in yrs.)	8	9	10	11	12
Height (in *cm*)	125	127	131	132	135

35. The following table gives the weight of a calf at different ages of 3 to 13 months :

Age (in months)	3	5	6	8	10	13
Weight (in *kg*)	115	195	235	315	375	435

Draw a smooth curve graph to represent it.

□

ANSWERS

Exercise 1

1. Four thousand, five hundred and ninety-two.
2. Seventy-seven thousand, five hundred and fifty-five.
3. One hundred and twenty-three thousand, four hundred and fifty-six.
4. Eight million, thirty-four thousand, five hundred and nine.
5. Eight thousand nine hundred and sixty-seven million, fifty-six thousand and thirty-two.
6. Fifty-six thousand and seven hundred million, forty-three thousand and one.
7. 100040782. **8.** 1567285002075. **9.** 8080080008
10. 100001000100101. **11.** (*i*) 50, (*ii*) 500000. (*iii*) 5000000.
12. (*i*) no units, (*ii*) no tens, (*iii*) no hundreds,
(*iv*) no hundreds of thousands ; no tens of thousands.
13. 9999999. **14.** 1000000. **15.** 979990. **16.** 9000.
17. 9740, 4079. **18.** 77610, 10677. **19.** 72963. **20.** 899999.

Exercise 2

1. One thousand, two hundred and five.
2. Nine lacs, nine hundred and nine.
3. Ninety lacs, fifty thousand, four hundred and three.
4. Ninety-nine crores, forty-five thousand and sixty-one.
5. One arab, twenty-two crores, three lacs, four thousand and sixty-four.
6. Nine kharabs, eighty-seven lacs, sixty thousand and twelve.
7. 7013578. **8.** 200708303.
9. 101010101001. **10.** 500500041002.

Exercise 3

1. 9, 11, 24. **2.** 312, 99. **3.** 600, 407, 665.
4. 900, 1205, 1708. **5.** 1900, 1219. **6.** 1800, 1879.
7. LXXXIX, LXXI, CCCI. **8.** CCLI, DIX, CMXCIX.
9. $\overline{\text{V}}$CDXXXII, MMDCCCLXXXVIII.
10. $\overline{\text{LXXXV}}$DCCCLXIX, DLXDII.

Exercise 4

1. 187623. **2.** 146728261. **3.** 48266421. **4.** 11106.
5. 14111059. **6.** 9239536.

Exercise 5

1. 22223. **2.** 199922. **3.** 2988120. **4.** 176977.
5. 128639.

Exercise 6

1. 788627. **2.** 45820698. **3.** 33660. **4.** 410000.
5. 3371277. **6.** 3178632. **7.** 86254476. **8.** 81067500.
9. 1442201355. **10.** 4924120320. **11.** 47881747494.
12. 7703449656. **13.** 323338457. **14.** 20431238784.
15. 62834805. **16.** 3785544.

Exercise 7

1. Q=8364. **2.** Q=862. **3.** Q=101, R=6174.
4. Q=12, R=66749. **5.** Q=36, R=20. **6.** Q=385, R=9.
7. Q=1848, R=131. **8.** Q=121, R=99. **9.** Q=2950, R=141.
10. Q=47346, R=48.

Exercise 8

1. 72. **2.** 125. **3.** 75. **4.** 655.
5. 13035. **6.** 1297. **7.** 759. **8.** 7086.
9. 125. **10.** 65. **11.** 0. **12.** 29.
13. 37. **14.** 33. **15.** 29.

Exercise 9

1. 55053. **2.** 31695. **3.** 123. **4.** 31.

Exercise 10

1. 5478. **2.** 518. **3.** 297. **4.** 74751. **5.** 10296.
6. 1000776. **7.** 9729. **8** 995930. **9.** 3, 3, 2. **10.** 10, 1, 6.

Exercise 11

1. 4. **2.** 12. **3.** 30. **4.** 105. **5.** 32. **6.** 14.

Exercise 12

1. 5. **2.** 917. **3.** 141. **4.** 199. **5.** 31.
6. 809. **7.** 4. **8.** 4. **9.** 46. **10.** 103.

Exercise 13

1. 12. **2.** 1 *hg* 9 *dag* 9 *g*. **3.** 4 *mm*.
4. 7 *m* ; 6, 7, 12 respectively. **5.** 1545. **6.** 318.

7. 74. **8.** 2136. **9.** 81. **10.** 11.

11. 6 *m*, 378 tiles. **12.** 30 tiles.

Exercise 14

1. 72. **2.** 2520. **3.** 1134. **4.** 220. **5.** 6825 **6.** 4368.

7. 5040. **8.** 240. **9.** 264. **10.** 1764. **11.** 17640.

12. 45045.

Exercise 15

1. 194097. **2.** 2800733. **3.** 48125. **4.** 589680.

Exercise 16

1. 9. **2.** 245. **3.** 297. **4.** 2 hours. **5.** 100 times.

Exercise 17

1. 184. **2.** 57. **3.** 2523. **4.** 498. **5.** 486.

6. 1257. **7.** 120. **8.** 1260. **9.** 960. **10.** 8640.

11. 1063. **12.** 9959.

Exercise 18

1. 160 *g*. **2.** *Rs* 2·80. **3.** 1 *kg* 830 *g*. **4.** 550 litres.

5. 1 *m* 80 *cm*.

Exercise 19

1. $\frac{1}{8}, \frac{1}{3}, \frac{13}{23}$. **2.** $\frac{5}{8}, \frac{1}{2}, \frac{3}{5}$. **3.** $\frac{37}{43}, \frac{5}{8}, \frac{17}{242}$. **4.** $\frac{17}{25}, \frac{9}{11}, \frac{69}{73}$.

5. $\frac{1}{2}, \frac{17}{29}, \frac{26}{27}$. **6.** $\frac{12}{13}, \frac{19}{23}, \frac{46}{141}$. **7.** $\frac{7}{75}, \frac{9}{17}, \frac{1}{5}$. **8.** $\frac{11}{21}, \frac{25}{26}, \frac{8}{11}$.

9. $\frac{4}{43}, \frac{23}{71}, \frac{29}{37}$. **10.** $\frac{13}{14}, \frac{19}{23}, \frac{15}{22}$.

Exercise 20

1. $1\frac{2}{3}, 1\frac{3}{5}, 6\frac{1}{4}$. **2** $3, 2\frac{5}{11}, 7\frac{3}{16}$. **3.** $3\frac{5}{23}, 1\frac{30}{71}, 2\frac{9}{83}$.

4. $3\frac{27}{28}, 3\frac{23}{129}$. 4. **5.** $\frac{29}{8}, \frac{86}{11}, \frac{68}{13}$. **6.** $\frac{123}{19}, \frac{83}{14}, \frac{26}{23}$.

7. $\frac{49}{31}, \frac{73}{23}, \frac{83}{41}$. **8.** $\frac{206}{13}, \frac{401}{21}, \frac{526}{25}$.

Exercise 21

1. $\frac{5}{14}, \frac{11}{18}, \frac{7}{9}$. **2.** $\frac{7}{15}, \frac{2}{3}, \frac{4}{5}, \frac{5}{6}$. **3.** $\frac{3}{7}, \frac{7}{12}, \frac{11}{14}, \frac{5}{6}$.

4. $\frac{1}{4}, \frac{2}{5}, \frac{11}{16}, \frac{7}{8}, \frac{19}{20}$. **5.** $\frac{15}{22}, \frac{7}{11}, \frac{5}{9}, \frac{8}{27}$. **6.** $\frac{4}{5}, \frac{3}{4}, \frac{2}{3}, \frac{5}{8}, \frac{7}{16}$.

7. $\frac{11}{14}, \frac{16}{21}, \frac{5}{7}, \frac{59}{84}, \frac{23}{42}$. **8.** $\frac{3}{2}, \frac{5}{11}, \frac{4}{9}, \frac{4}{5}, \frac{2}{5}$.

Exercise 22

1. $2\frac{4}{15}$. **2.** $2\frac{9}{16}$. **3.** $2\frac{121}{210}$. **4.** $9\frac{47}{120}$. **5.** $4\frac{1}{6}$. **6.** $4\frac{55}{84}$.

7. $9\frac{7}{36}$, **8.** $6\frac{43}{48}$. **9.** $55\frac{1}{24}$. **10.** $13\frac{3}{20}$.

Exercise 23

1. $\frac{1}{4}$. **2.** $\frac{1}{8}$. **3.** $\frac{1}{6}$. **4.** $2\frac{9}{14}$. **5.** $2\frac{5}{16}$.

6. $17\frac{31}{36}$. **7.** $74\frac{2}{9}$. **8.** $31\frac{6}{143}$.

Exercise 24

1. $\frac{13}{60}$. **2.** $\frac{79}{144}$. **3.** $1\frac{197}{360}$. **4.** $2\frac{5}{24}$. **5.** $3\frac{1}{4}$.
6. $\frac{11}{12}$. **7.** $5\frac{41}{88}$. **8.** $\frac{9}{10}$. **9.** $\frac{25}{42}$. **10.** *Rs* $59\frac{1}{16}$

Exercise 25

1. $3\frac{1}{9}$. **2.** $83\frac{1}{4}$. **3.** 270. **4.** 172. **5.** $10\frac{2}{9}$ **6.** $\frac{5}{14}$.
7. $\frac{5}{21}$. **8.** $\frac{3}{5}$. **9** $3\frac{5}{68}$. **10** $\frac{5}{24}$ **11.** $62\frac{2}{9}$. **12.** $16\frac{1}{9}$.
13. $1\frac{11}{16}$. **14.** $7\frac{2}{3}$. **15.** $\frac{14}{39}$.

Exercise 26

1. $\frac{5}{91}$. **2.** $\frac{5}{31}$. **3.** $1\frac{2}{3}$. **4.** $\frac{3}{7}$. **5.** $1\frac{1}{6}$. **6.** $\frac{2}{3}$.
7. $\frac{5}{14}$. **8.** $1\frac{2}{3}$. **9.** $\frac{5}{6}$. **10.** $2\frac{1}{10}$. **11.** $2\frac{139}{969}$. **12.** $394\frac{7}{8}$.

Exercise 27

1. $9\frac{9}{20}$. **2.** $6\frac{1}{8}$. **3.** $24\frac{1}{2}$. **4.** $20\frac{103}{250}$. **5.** $\frac{7}{40}$. **6.** $2\frac{2}{3}$.
7. $7\frac{1}{5}$. **8.** $6\frac{1}{4}$. **9.** $1\frac{1}{12}$. **10.** 1.

Exercise 28

1. $1\frac{9}{22}$. **2.** $2\frac{4}{5}$. **3.** $1\frac{26}{155}$. **4.** $\frac{2}{9}$. **5.** $\frac{1}{9}$. **6.** $25\frac{7}{38}$.
7. $2\frac{17}{20}$. **8.** $7\frac{91}{216}$. **9.** $\frac{1}{4}$. **10.** 10.

Exercise 29

1. $\frac{9}{14}$. **2.** $1\frac{13}{15}$. **3.** $1\frac{3}{4}$. **4.** $\frac{36}{67}$. **5.** $\frac{31}{222}$. **6.** $\frac{5}{12}$.

Exercise 30

1. $\frac{1}{100}$. **2.** $\frac{7}{20}$. **3.** $\frac{1}{8}$. **4.** 40 minutes.
5. 32 minutes. **6.** 48 minutes. **7.** 32 minutes.
8. 8 pieces ; $2\frac{2}{3}$. *m* **9.** *Rs* 111. **10.** *Rs* 15. **11.** 256 sticks.
12. *Rs* 1095. **13.** 208 *km*. **14.** 200 students.

Exercise 31

1. $\frac{3}{80}$. **2.** $\frac{1}{16}$. **3.** $\frac{5}{19}$. **4.** $\frac{1}{1250}$ **5.** $8\frac{16}{125}$. **6.** $2\frac{3}{125}$.

Exercise 32

1. 3·4 **2.** 27·231. **3.** 85·883. **4.** 108·0605. **5.** 326·1511.

Exercise 33

1. 22·802. **2.** 41·945. **3.** 78·655. **4.** 900·999.
5. 635·9644. **6.** 16·996.

Exercise 34

1. 3·5, 35, 350. **2.** 3·42, 342. **3.** 19219·2 **4.** ·552, 3·6432.
5. 2·25. **6.** 2·2627. **7.** 1·31391. **8.** 11·64174.
9. 30·316. **10.** 10·8745 miles.

Exercise 35

1. 1·7. **2.** 2·5. **3.** ·025403 **4.** ·00864
5. ·08. **6.** ·0087. **7.** 20000. **8.** 545·6.
9. 8000. **10.** 1·3. **11.** 1·5. **12.** 200
13. ·00002. **14.** ·704. **15.** 5·611. **16.** 65040·650.
17. 6421 820. **18.** ·63 ; ·45 *cm*. **19.** 31 ; 6·3 *cm*.
20. 545.

Exercise 36

1. 28·753. **2.** 986·34002. **3.** 9·67. **4.** 466·117.
5. 231·56. **6.** 9·93. **7.** 2 155. **8.** ·625.
9. 1053·73. **10.** 77·691.

Exercise 37

1. ·5. **2.** ·375. **3.** ·3125. **4.** ·32. **5.** ·032.
6. ·03824. **7.** 6·5703125. **8.** 2·015625. **9.** ·379. **10.** ·077.
11. ·783. **12.** ·864. **13.** 1·545. **14.** ·6818. **15.** ·1428.

Exercise 38

1. ·02. **2.** ·6. **3.** 3·8. **4.** 5·403 *kg* **5.** 4·05 *km*.
6. ·065. **7.** ·1505. **8.** ·015015. **9.** ·0117. **10.** ·00507.
11. ·000805. **12.** 2·05. **13.** 0·61. **14.** 0·59. **15.** 0·378.

Exercise 39

1. 32. **2.** 43. **3.** 208. **4.** 441. **5.** 253. **6.** 476.
7. 456. **8.** 673. **9.** 739. **10.** 1059. **11.** 6. **12.** 11.
13. 5. **14.** 75. **15.** 54.

Exercise 40

1. ·8. **2.** ·32. **3.** ·43. **4.** ·27. **5.** ·28. **6.** ·015
7. ·024. **8.** 2·11. **9.** 11·3. **10.** 14·5. **11.** 20·6. **12.** 1·04.
13. 12·13. **14.** 3·01. **15.** 14·7.

Exercise 41

1. ·316. **2.** ·447. **3.** ·547. **4.** ·632. **5.** 2·449.
6. 2·646. **7.** 13·527. **8.** 31·416. **9.** 6·357. **10.** 7·424.
11. 17·9368. **12.** 1·7606. **13.** 3·0983. **14.** 2·2360. **15.** ·9486.

Exercise 42

1. $\frac{21}{22}$. **2.** $\frac{25}{27}$. **3.** $3\frac{1}{2}$. **4.** $3\frac{1}{3}$. **5.** $2\frac{1}{6}$. **6.** $1\frac{1}{11}$.
7. $\frac{27}{43}$. **8.** $2\frac{1}{7}$. **9.** $\frac{16}{23}$. **10.** $\frac{1}{9}$.

Exercise 43

1. 2165. **2.** ·866. **3.** ·852. **4.** ·816. **5.** ·408.
6. ·620. **7.** ·641. **8.** 1·336. **9.** 1·050. **10.** 1·490.

Exercise 44

1. 35. **2.** 42. **3.** 75. **4.** 13 days. **5.** 46 paise.
6. 20. **7.** 4 metres. **8.** 76. **9.** 40. **10.** 151.

Exercise 45

1. 6. **2.** 9. **3.** 11. **4.** 15. **5.** 21.
6. 25. **7.** 27. **8.** 25. **9.** 54. **10.** 72.

Exercise 46

1. 3. **2.** 6. **3.** 10. **4.** 36.

Exercise 47

1. $\frac{1}{6}$. **2.** $\frac{3}{4}$. **3.** $\frac{5}{8}$. **4.** $\frac{11}{13}$. **5.** $1\frac{1}{7}$.

Mental Agility Test No. 1

1. 8. **2.** 150. **3.** 9. **4.** 700. **5.** 48. **6.** 350.
7. 3. **8** 5000. **9.** 17. **10.** 300. **11.** 8000. **12.** 50.
13. 700. **14.** 90. **15.** 3. **16.** 60. **17.** 8. **18.** 6.
19. 28. **20.** 36. **21.** 4. **22.** 365. **23.** 909. **24.** 12·34.
25. 473. **26.** 4·321. **27.** 1029. **28.** 1·023. **29.** 7·49. **30.** ·987.
31. 1. **32.** $\frac{1}{7}$. **33.** $\frac{3}{7}$. **34.** $\frac{4}{7}$. **35.** $\frac{1}{6}$. **36.** $\frac{1}{3}$.
37. ·3. **38.** 0. **39.** ·01. **40.** ·1. **41.** ·6. **42.** ·02.
43. ·006. **44.** ·001. **45.** 473·6. **46.** 4736. **47.** 1·3. **48.** 13.
49. ·6079. **50.** ·06079. **51.** 11. **52.** ·1. **53.** $\frac{2}{3}$.
54. $\frac{4}{5}$. **55.** 3. **56.** $\frac{1}{2}$. **57.** 1. **58.** 1. **59.** 6.
60. 1.

Objective Type Questions—Series I

1. (*a*) thrice (*b*) thrice (*c*) *Re* 0·06. (*d*) compound
(*e*) longer (*f*) shorter (*g*) multiple (*h*) 1000
(*i*) lighter (*j*) heavier (*k*) less (*l*) 1000
2. (*a*) six (*b*) nine (*c*) ten (*d*) three.
(*e*) five (*f*) hundred.
3. (*a*) local (*b*) greatest (*c*) no (*d*) IX
(*e*) DCC (*f*) continued. (*g*) litre (*h*) metre (*i*) weight
(*j*) same denomination (*k*) product (*l*) lowest terms
(*m*) left (*n*) right.
4. (*a*) D, (*b*) C, (*c*) C, (*d*) B.
5. (*a*) '×' has to be dealt with after '÷'.
(*b*) 'of' ought to have been dealt with before '÷'.
(*c*) 'Of' ought to have been dealt with before '÷'.
(*d*) Addition of $\frac{2}{5}+\frac{1}{2}$ should not have preceded 'of' and division.

Revisional Exercise—I

1. 131362. **2.** 1774. **3.** 393. **4.** 90168.

5. 2329398. **6.** 11 ; $R=128$.

7.

17	24	1	8	15
23	5	7	14	16
4	6	13	20	22
10	12	19	21	3
11	18	25	2	9

8. 3. **9.** 221. **10.** 9 litres.

11. 240 **12.** 24 *m*. **13.** *Rs* 84.

14. 5l. **15.** *Rs* 1230. **16.** *Rs* 180·84.

17. 45. **18.** *Rs* 406·14 **19.** 18 tables.

20. (*a*) 5437·896 *dag*. (*b*) 54·37896 *kg*.

(*c*) 54 *kg* 3 *hg* 7 *dag* 8 *g* 9 *dg* 6 *cg*.

21. 28 *kg* 1 *dag* 1 *g*. **22.** 4 *kg* 2 *hg* 6 *dag* 3 *g*. **23.** 101 *m* 9 *dm* 5 *cm*.

24. 3 *km* 1 *hm* 7 *dam* 6 *m*. **25** $\frac{20}{24}$, $\frac{21}{24}$, $\frac{23}{24}$. **26.** $\frac{102}{103}$. **27.** $\frac{5}{6}$.

28. $\frac{3}{4}$. **29.** $\frac{5}{6}$, $\frac{3}{4}$, $\frac{2}{3}$. **30.** $8\frac{35}{72}$. **31.** $4\frac{49}{72}$.

32. $\frac{2}{3}$. **33.** 32·478. **34.** 8·754.

35. 1st men ; 1·01 *kg* **36.** 8 *mts*. 25 *sec*.

37. ·001989. **38.** 13000 **39.** *Rs* 87·50.

40. $\frac{3}{7}$. **41.** $8\frac{1}{2}$.

42. 572. **43.** 1607. **44.** 4·57.

45. 0·4714. **46.** 0 654. **47.** 28. **48.** $\frac{15}{22}$.

Exercise 48

1. (*i*) $\frac{1}{10}$. (*ii*) $\frac{2}{5}$. (*iii*) $\frac{1}{8}$. (*iv*) $\frac{1}{8}$. (*v*) $\frac{1}{12}$.

2. (*i*) 25%. (*ii*) $12\frac{1}{2}$%, (*iii*) $16\frac{2}{3}$%. (*iv*) $84\frac{8}{13}$% (*v*) 21%.
(*vi*) 43·9%.

3. *Rs* 70. **4.** *Rs* 500. 50. *P*. **5.** 1 *kg* 500 *g*.

6. 1 *kg* 7 *hg* 5 *dag* 8 *g*.

Exercise 49

1. *Rs* 75. **2.** *Rs* 345·50. **3.** *Rs* 101·25.

4. 391 litres. **5.** *Rs* 2767·50. **6.** 512.

7. *Rs* 1200. **8.** 8000 mangoes. **9.** *Rs* 164·80.

10. *Rs* 300. **11.** $11\frac{3}{7}$%. **12.** *Rs* 300.

13. 1200 mangoes. **14.** 350 metres. **15.** 800.

Exercise 50

1. *Rs* 36 gain **2** *Rs* 10·25 loss. **3.** 20%. **4.** $11\frac{1}{9}$%.

5. $15\frac{5}{13}$%. **6.** $5\frac{10}{13}$%. **7.** 4% **8.** 25%.

9. $14\frac{2}{7}$%. **10.** $4\frac{8}{13}$% loss.

Exercise 51

1. *Rs* 10 50. **2.** *Rs* 44·25. **3.** *Rs* 2·70. **4** *Rs* 40·42.
5. *Rs* 4·07 per *kg*.

Exercise 52

1. *Rs* 200. **2.** *Rs* 400. **3.** *Rs* 3. **4.** *Rs* 207. **5.** *Rs* 166·64.

Exercise 53

1. *Rs* 2·70 ; *Rs* 32·70. **2.** *Rs* 18 ; *Rs* 68. **3.** *Rs* 3 00 ; *Rs* 78·00.
4. *Rs* 1190. **5.** *Rs* 57·75. **6.** *Rs* 133·35.
7. *Rs* 1729. **8.** *Rs* 2610. **9.** *Rs* 2260.
10. *Rs* 105. **11.** *Rs* 25·23. **12.** *Rs* 70.
13. *Rs* 36. **14.** *Rs* 26·60. **15.** *Rs* 68.

Exercise 54

1. *Rs* 5·50. **2.** *Rs* 48 **3** *Rs* 11 25. **4.** *Rs* 6·25
5. *Rs* 5085.

Exercise 55

1. *Rs* 875. **2.** *Rs* 378. **3.** *Rs* 5093·75. **4.** *Rs* 11·25.

Exercise 56

1. *Rs* 676. **2.** *Rs* 496·13. **3.** *Rs* 102·50. **4.** *Rs* 408.
5. *Rs* 609. **6.** *Rs* 1324. **7.** *Rs* 1082. **8.** *Rs* 228·75.

Exercise 57

1. *Rs* 81. **2.** *Rs* 279·10. **3.** *Rs* 1050·63. **4.** *Rs* 492·10.
5. *Rs* 303·01. **6.** *Rs* 65·95.

Exercise 58

1. *Rs* 625. **2.** *Rs* 36 **3.** *Rs* 4000. **4.** *Rs* 400.
5. *Rs* 12500. **6.** *Rs* 5000.

Exercise 59

1. *Rs* 108·25. **2.** *Rs* 233·75. **3.** *Rs* 59. **4.** *Rs* 551.

Exercise 62

1 40 sq. *m*. **2.** 96 sq. *m*. **3.** 130 sq. *m*.
4. 5074 sq. *m*. **5.** 1 sq. *m*. 9775 sq. *cm*. **6.** 5625 sq. *m*.
7. 4 2025 sq. *m*. **8.** 46 *m*. **9.** 42 *m*. 14 *cm*.
10. 248 *m* 50 *cm*. **11.** 25 *m*. **12** 27 *m*. 50 *cm*.
13. 225 sq *m*. **14.** 10000 sq. *m*. **15.** 798600 sq. *m*.
16. 2079 sq. *m*.

Exercise 63

1. 52 *m*. **2.** 65 *m*. **3.** 24 *m* 50 *cm*. **4.** 127 *m* 31 *cm*.
5. 17 *m*. **6.** 19·5 *m*.

Exercise 64

1. *Rs* 71·68. **2.** 516 *m*. **3.** *Rs* 28·75. **4.** 90.
5. *Rs* 37·20. **6.** *Rs* 12·48. **7.** 400. **8.** 400.
9. 120. **10.** 750 *m* ; *Rs* 900. **11.** *Rs* 158·40
12. 25000 ; *Rs* 1750.

Exercise 65

1. 88 sq. metres. **2.** 8900 sq. metres. **3.** 666 sq. metres.
4. 150 sq. metres. **5.** 230 sq. metres. **6.** 73·5 sq. metres.
7. 560 sq. metres. **8.** 5600. **9.** *Rs* 125·97.
10. *Rs* 384.

Exercise 66

1. 3141 sq metres. **2.** 1641 sq. metres ; *Rs* 8205.
3. 432·75 sq. metres ; *Rs* 519·30. **4.** 74 sq. metres ; 1276 sq. metres.

Exercise 67

1. *Rs* 24·30. **2.** *Rs* 96. **3.** *Rs* 240·74. **4.** *Rs* 27·12.
5. *Rs* 27·80. **6.** *Rs* 487·68. **7.** *Rs* 11·50. **8.** 36 metres.
9. 44 metres. **10.** *Rs* 339. **11.** *Rs* 1930·50. **12.** *Rs* 36·90
13. *Rs* 95·25. **14.** *Rs* 176·55. **15.** *Rs* 48, *Rs* 25.

Exercise 68

1. 60 cub. metres. **2.** 36 cubic metres. **3.** 112 cub. metres.
4. 13·86 cubic metres. **5.** 27·4125 cubic metres.
6. 3375 cubic metres. **7.** 15625 cub. metres. **8.** 3240 cubic *dm*.
9. 1540 cubic *cm*. **10.** 64·8 cubic metres. **11.** 2100000 litres.
12. *Rs* 56. **13.** *Rs* 16·20. **15.** 384.
14. 480 cubic metres ; *Rs* 720.
16. 48000 bricks.

Exercise 69

1. 1350 sq. *m*. **2.** 3750 sq. *cm*. **3.** 52 sq. *cm*. **4.** 960 sq. *m*.
5. *Rs* 800.

Exercise 70

1. 8 *cm*. **2.** 10 metres. **3.** 5 metres. **4.** 3·5 metres.
5. 4 metres. **6.** 0·3 metres.

Exercise 71

12. *Rs* 40 ; *Rs* 40. **13.** *Rs* 24.

Mental Agility Test No. 2

1. ·001. **2.** ·000001. **3.** ·99. **4.** ·999. **5.** 10. **6.** 100.
7. ·047. **8.** 470. **9.** ·0047. **10.** 4700. **11.** ·9. **12.** ·09.

13. 3·4. **14.** ·34. **15.** ·034. **16.** ·043. **17.** ·5. **18.** ·25
19. ·2. **20.** ·75. **21.** $\frac{3}{10}$. **22.** $\frac{33}{100}$. **23.** $\frac{33}{10}$. **24.** $\frac{3}{1000}$.
25. 7%. **26.** 30% **27.** 37% **28.** 7·3%. **29.** 50%. **30.** 15%.
31. $\frac{17}{100}$. **32.** $\frac{9}{100}$. **33.** $\frac{1}{5}$. **34.** $\frac{1}{4}$. **35.** ·47. **36.** ·8.
37. ·04. **38.** ·15. **39.** *Rs* 21. **40.** *Rs* 63. **41.** 100. **42.** 100.
43. 1. **44.** 10. **45.** 1000. **46.** 1000. **47.** 1. **48.** 1
49. 1000. **50.** 10.

Objective Type Questions—Series II

1. (*a*) T (*b*) F (*c*) T (*d*) T (*e*) F (*f*) T (*g*) T
(*h*) T (*i*) F

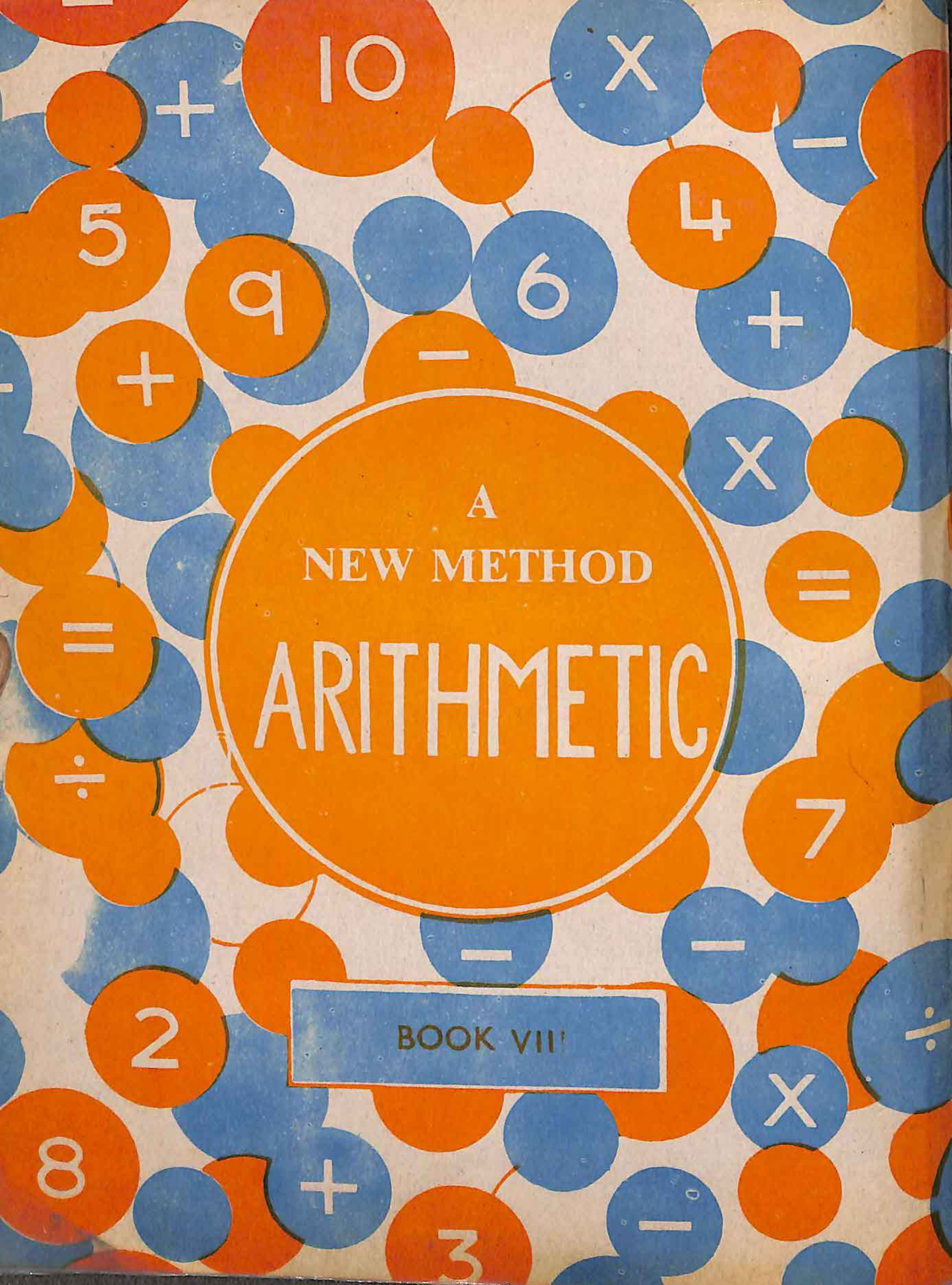
2. (*a*) profit (*b*) C.P. (*c*) equal (*d*) perimeter
(*e*) amount
(*f*) volume (*g*) equal (*h*) equal/square
(*i*) two.

3. (*a*) D. (*b*) C. (*c*) D. (*d*) B. (*e*) D.
(*f*) D. (*g*) D. (*h*) D.

Revisional Exercise—II

1. 5850. **2.** 180. **3.** $4\frac{8}{13}\%$. **4.** 225.
5. 70%. **6.** $16\frac{2}{3}\%$. **7.** *Rs* 40·42. **8.** *Rs* 167.
9. *Rs* 8373·75. **10.** *Rs* 728·52. **11.** *Rs* 5.
12. *Rs* 7409·50. **13.** *Rs* 945·75. **14.** *Rs* 689·92. **15.** *Rs* 5000
16. B gains *Rs* 10 more. **17.** *Rs* 138·10.
18. *Rs* 161·50. **19.** *Rs* 159·95. **20.** *Rs* 47·30.
21. *Rs* 284·80. **22.** 300 metres. **23.** *Rs* 1940·40.
24. *Rs* 1562·88. **25.** *Rs* 420. **26.** *Rs* 4861·15. **27.** *Rs* 23·35.
28. 63000 *kl*. **29.** 64·8 cubic metres. **30.** 30 metres.

□



A
NEW METHOD
ARITHMETIC

BOOK VIII